United States
Department of
Agriculture

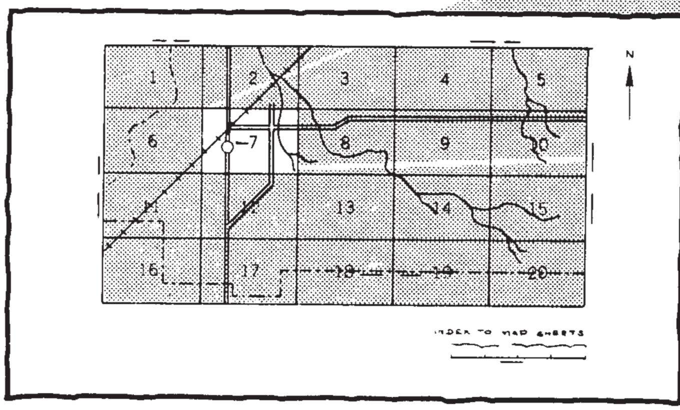
Soil
Conservation
Service

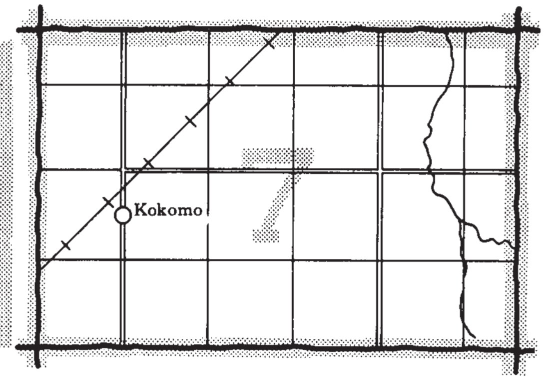
In cooperation with
Missouri
Agricultural
Experiment
Station

Soil Survey of St. Charles County Missouri

HOW TO USE

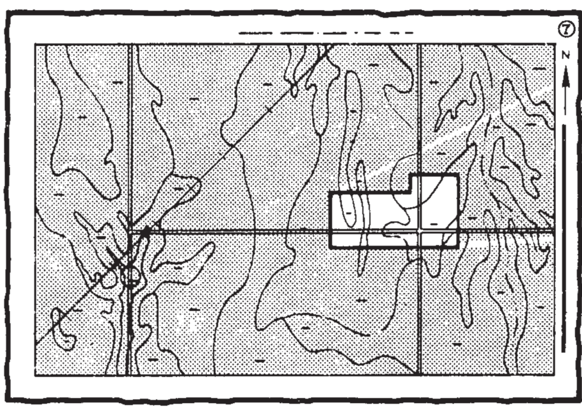
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

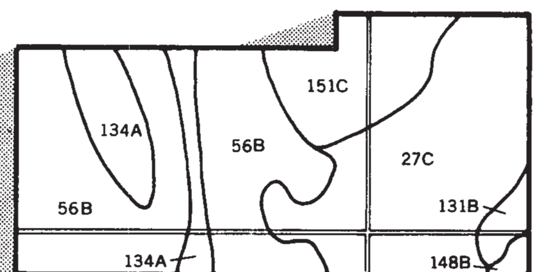




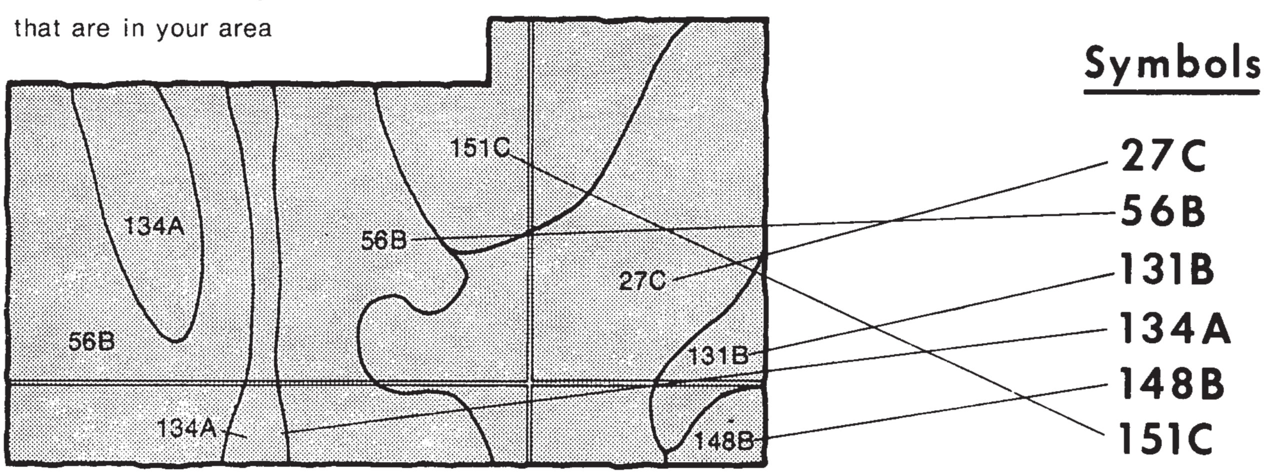
2. Note the number of the map sheet and turn to that sheet.

3. Locate your area of interest on the map sheet.



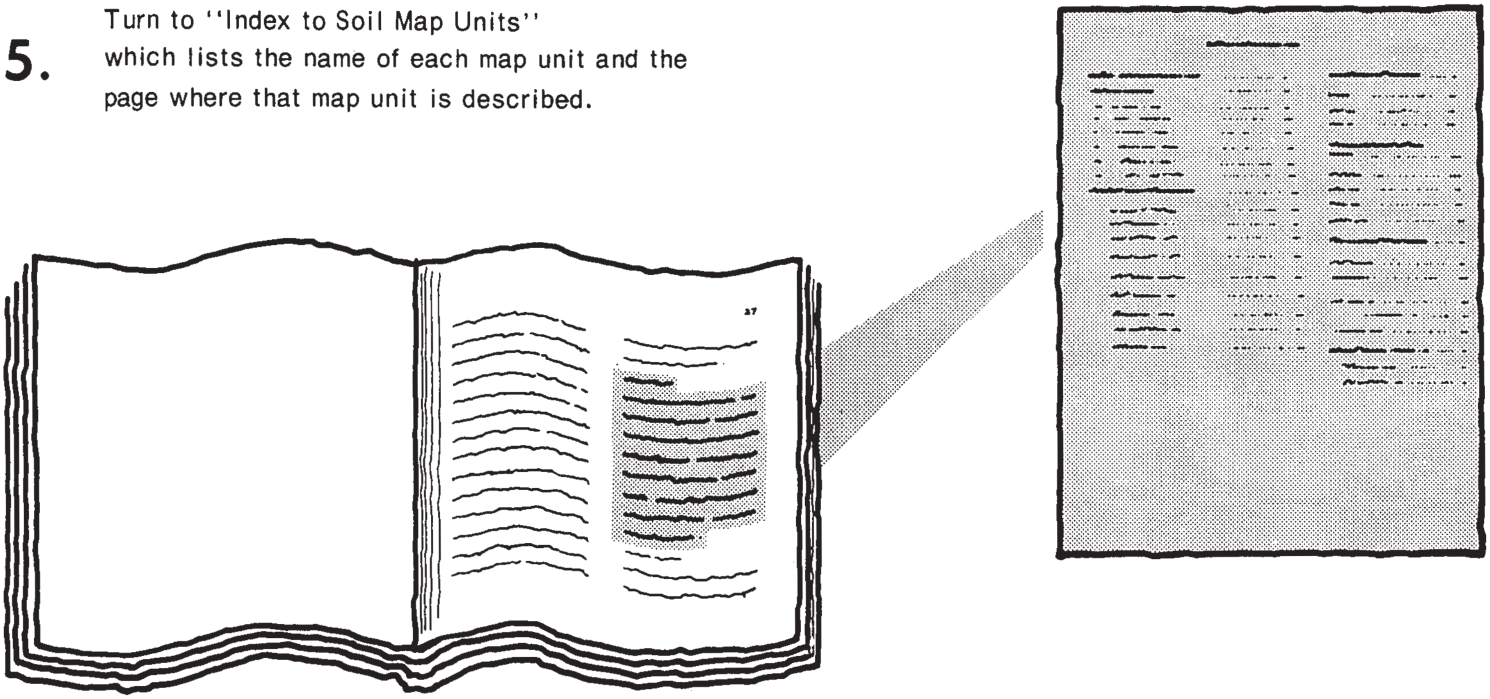


4. List the map unit symbols that are in your area

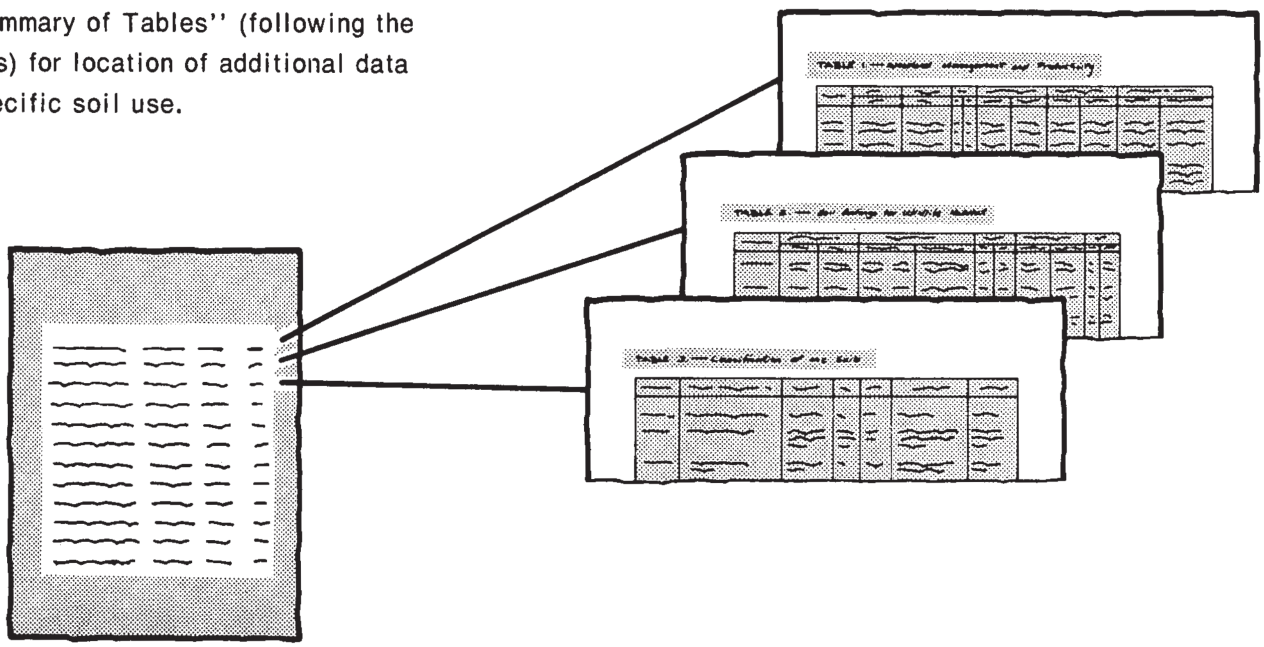


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; for specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Missouri Agricultural Experiment Station, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Departrnent of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This soil survey was prepared by the United States Department of Agriculture, Soil Conservation Service, in cooperation with the Missouri Agricultural Experiment Station. The County Court, through the CETA program, provided personnel to assist with the fieldwork. The Missouri Department of Natural Resources provided a soil scientist to assist with the fieldwork and contributed funds to assist with the map finishing. It is part of the technical assistance furnished to the St. Charles County Soil and Water Conservation District. Major fieldwork for this soil survey was performed in the period 1974-1978. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Typical view of soils in the Armster-Mexico-Hatton Association.

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Issued May 1982

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foreword

This soil survey contains information that can be used in land-planning programs in St. Charles County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

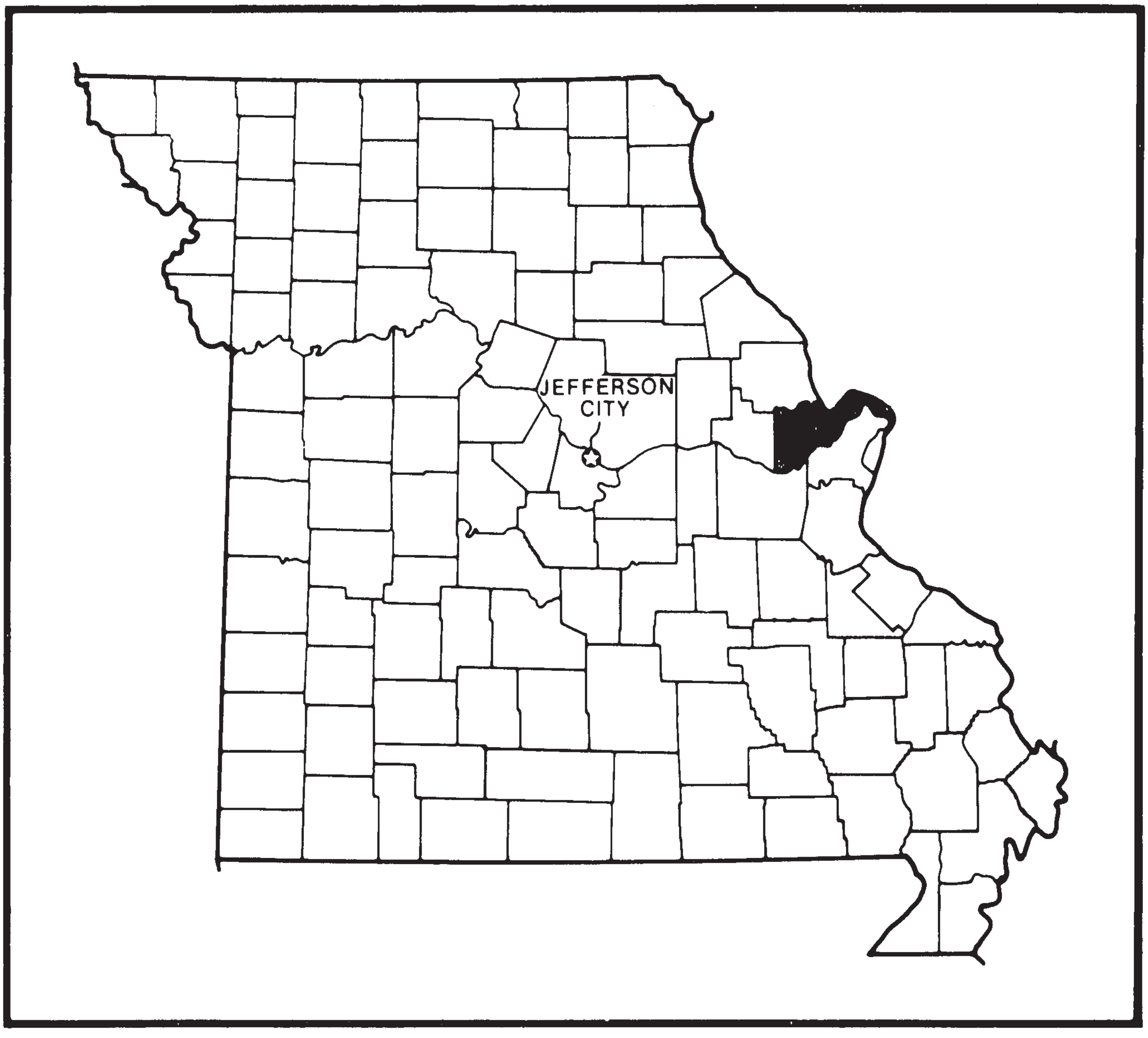
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Paul F. Larson

Paul F. Larson
State Conservationist
Soil Conservation Service



Location of St. Charles County in Missouri.

soil survey of
St. Charles County, Missouri

By Richard L. Tummons, Soil Conservation Service

Fieldwork by Richard L. Tummons, Party Leader, and Robert J. Held, Soil Conservation Service;
F. Michael Struckhoff, Missouri Department of Natural Resources; and
Alan R. Bruns, Mary S. Burt, and Paul B. Freese, St. Charles County Soil and Water Conservation District.

United States Department of Agriculture, Soil Conservation Service
in cooperation with the Missouri Agricultural Experiment Station

St. Charles County is in the east-central part of Missouri. It has an area of about 586 square miles, or 375,040 acres. St. Charles is the county seat and is located in the south-central part of the county. According to the 1980 census, the population of St. Charles was 37,272 and the population of the county was 143,659.

St. Charles County has the fastest growing population in the state. Its population increased by 75 percent between 1960 and 1970 and by 54 percent between 1970 and 1980. Business and industry are also rapidly increasing, with a special emphasis on home building. Despite the rapid loss of agricultural land to urban development each year, agriculture remains a large industry in the county.

About 56 percent of the acreage in the county is cropland, 19 percent is used for nonfarming purposes, and 25 percent is woodland. Two-thirds of the farm income is from cash-grain farming and one-third from livestock farming (*21*).

Corn, soybeans, and wheat are the principal cash crops. Beef cattle, dairy cattle, and hogs are the predominant livestock. The prairie region in the northwest part of the county and the deep loess hills bordering the Missouri and Mississippi Rivers support mixed livestock and cash-grain farming. The Missouri and Mississippi River bottoms are used almost exclusively for cash-grain farming. The deeply dissected rocky soils of the southwest region produce most of the timber and woodland products of the county.

The need for erosion control on sloping cropland and in developing urban areas overshadows all other soil management problems in St. Charles County. Soils of the Mexico and Keswick series in the prairie region and the Menfro, Weller, and Harvester series in the deep loess area are susceptible to severe sheet and gully erosion.

Most of the river bottom land in the county has the potential for increased yields under supplemental irrigation. Some areas of Menfro soils have a good potential for orchards and vineyards.

This survey updates the earlier survey of St. Charles County that was published in 1956 (*14*). It defines the soils boundaries more clearly, and provides more detailed information on the soils.

general nature of the county

This section gives general information concerning the county. It discusses climate; natural resources; settlement and population; relief and drainage; communication, transportation, and industry; and educational, cultural, and recreational facilities.

climate

Prepared by the National Climatic Center, Asheville, North Carolina

The consistent pattern of climate in St. Charles County is one of cold winters and long and hot summers. Heavy

rains occur mainly in spring and early in summer, when moist air from the Gulf of Mexico interacts with drier continental air. The annual rainfall is normally adequate for corn, soybeans, and all grain crops.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Lambert Airport, St. Louis County, Missouri in the period 1951 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 33 degrees F, and the average daily minimum temperature is 24 degrees. The lowest temperature on record, which occurred at Lambert Airport on January 23, 1963, is -11 degrees. In summer the average temperature is 77 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred at Lambert Airport on July 14, 1954, is 115 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 33.81 inches. Of this, 20 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 16 inches. The heaviest 1-day rainfall during the period of record was 3.95 inches at Lambert Airport on June 14, 1957. Thunderstorms occur on about 50 days each year, and most occur in summer.

Average seasonal snowfall is 18 inches. The greatest snow depth at any one time during the period of record was 12 inches. On an average of 9 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in March.

natural resources

The soil and its associated crops are the most important natural resources of St. Charles County. Many products are derived, either directly or indirectly, from the soil: crops, livestock, wood, fruits, vegetables, and honey are all produced on farms and are marketable items. Not only does the soil produce crops, but thick soil cover is suitable for many urban uses, such as construction and waste disposal. In addition, the soil is a source of topsoil, sand, and gravel.

Another abundant resource of the county is its water supply. Located near the confluence of the Missouri and Mississippi Rivers, the county is well situated with respect to surface water supplies. These rivers can assimilate large amounts of waste and still provide an abundance of good surface water for major users. Their tributary streams are used for recreation as well as for transportation of waste, a use which the rapid urbanization in St. Charles County has made increasingly important (*11*).

A large but relatively undeveloped water resource is stored in the bedrock and alluvium underlying St. Charles County. Some of it is too mineralized, but most of it is fresh and of good quality. The bedrock units in St. Charles County are generally assigned to various aquifer groups. By determining which aquifer groups are present at any given area, the yield and quality of water from wells can be anticipated. The major alluvial aquifers are the water-saturated sands and gravels underlying flood plains of the Mississippi and Missouri Rivers.

Mineral resources in the county include limestone, industrial sand, refractory clay, structural clay, and shale. Of these, only limestone and industrial sand have a significant future in economic development.

settlement and population

The strategic location of St. Charles County at the confluence of the Mississippi, Missouri, and Illinois Rivers has greatly enriched its history. The county was the hub of the river transportation of the country and was the site of a wide variety of activities by various peoples and cultures over a long period of time.

Prior to settlement, many different Indian tribes inhabited what is now St. Charles County. The Missourian, Osage, Sioux, Iowa, Oto, Winnebago, Sac, and Fox tribes were among those who claimed the area as their home.

With the coming of settlers, the county was first under Spanish rule and subsequently under the French government. The first settlement was established at St. Charles in 1769 by a Frenchman, Louis Blanchette. He named the settlement "Les Petites Cotes" (The Little Hills). Blanchette was the civil military governor of the area until his death in 1793. The first American settlers came mainly from Kentucky, Virginia, and Tennessee. Colonel Daniel Boone settled in part of the county known as Darst's in 1795. Later he was appointed commander of the Femme Osage District.

The area came into the United States as part of the Louisiana Purchase of 1803. The St. Charles settlement grew, but a large part of the county remained in wilderness. As more and more settlement occurred and population grew, a formal government developed. St. Charles County was organized in 1812 with St. Charles

as the county seat. The formation of Montgomery and Lincoln Counties 6 years later reduced the county to its present size (*10*). St. Charles served as the first state capital of Missouri from 1820 to 1825.

The large wave of German immigration began in the 1830's. The Germans were experienced farmers and brought a language and culture that had a great impact on development in the area (*5*). Farming at this time was the main economic base of the area. Corn, wheat, and livestock were major income sources.

The population of St. Charles County was 11,454 in 1850. Increased river transportation and the establishment of railroads encouraged the growth of the area, and by 1900 the population was 12,474. The 1980 population of 143,659 resulted from increased industrial job opportunities and the large number of people moving out of the St. Louis area to subdivisions in the county.

relief and drainage

St. Charles County has a number of major physiographic regions. The alluvial flood plains of the Mississippi and Missouri Rivers are dominant and occupy the county's northeast and south boundaries, respectively. A band of loess-covered hills of varying thickness borders these river plains. The northwest part of the county is a prairie region of loess and glacial till. A band of dominantly residual soils is to the south of this region.

Bedrock is exposed only on the steeper landscapes of the county. Bedrock of the Tertiary-Quaternary Age is under flood plains of the two rivers, and most of the uplands are underlain by rock of the Mississippian Age. Ordovician bedrock occupies a small southwest corner of the county uninfluenced by glaciers (*11*).

Elevation ranges from about 380 feet above sea level at the confluence of the Missouri and Mississippi Rivers to about 800 feet above sea level in the south-central part of the county.

About the northern 70 percent of St. Charles County drains into the Mississippi River, and the southern 30 percent drains into the Missouri River. State Highway 94 and County Highway D roughly are near the divided between the two major drainage systems. Femme Osage Creek is the major tributary of the Missouri River. Dardenne Creek, Peruque Creek, and the Cuivre River are the major tributaries of the Mississippi River.

communications, transportation, and industry

Newspapers are published in the county at St. Charles, St. Peters, O'Fallon, and Wentzville. Several St. Louis daily newspapers are also distributed throughout the county. There are two power companies and three telephone companies. Radio and television reception is excellent, and a wide variety of area stations is available.

St. Charles County has good transportation facilities. Interstate 70 passes through the approximate middle of the county from east to west. U.S. 61 dissects it from the southeast to the northwest. State Highways 79 and 94 parallel the Mississippi and Missouri Rivers, respectively. The community is served by two railroads, three truck lines, and three county airfields. Lambert-St. Louis International Airport also serves the community with numerous major airlines.

The county has about 70 industrial operations providing goods and services and employs over 8,500 workers. The principal products are electronic equipment, chemicals, clothing, railroad freight cars, and metal products. A large percent of the labor force works in the St. Louis metropolitan area and commutes to homes in the county (*9*).

educational, cultural, and recreational facilities

Five high schools, 4 junior high schools, and 18 elementary schools are in the county. Colleges and universities that serve the area include Lindenwood College at St. Charles, St. Mary's College at O'Fallon, and the University of Missouri-St. Louis.

The culture of St. Charles County is rich in French and German tradition and has been well preserved. The "old section" of St. Charles contains many old homes, stores, and shops which are restored to their original state. Tourists can enjoy buying goods, foods, and wines much the same as they did in the 19th century. The Daniel Boone home in the Femme Osage Valley is also well preserved and a popular tourist attraction.

The county has many municipal, commercial, and public facilities developed and maintained for recreation. There are parks with areas for sports and picnicking. Boat docks are along the rivers for boating and fishing. There is a wildlife area that has over 6,000 acres of land with lakes for fishing and natural cover for hunting and nature observations. It also contains a shooting range and picnic area.

how this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places.

They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map units" and "Detailed soil map units."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

general soil map units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, a soil association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other associations but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one soil association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent counties. Differences are the result of better knowledge of soils, modifications in series concepts, the map scale used, or the extent of soils in the survey.

soil associations

1. Armster-Mexico-Hatton association

Gently sloping and moderately sloping, moderately well drained and somewhat poorly drained soils formed in loess and clayey glacial till; on uplands

This association consists of a partly loess-covered glacial till plain that occupies most of the higher areas of the county and the narrow ridges and side slopes below it (fig. 1).

This association covers about 21 percent of the county. It is about 28 percent Armster soils, 18 percent Mexico soils, and 16 percent Hatton soils. The remaining 38 percent is minor soils.

Armster soils are moderately sloping and moderately well drained. They are on side slopes below the Hatton and Mexico soils. Typically, the surface layer is very dark grayish brown silt loam. The subsurface layer is dark grayish brown silt loam. The subsoil is brown, mottled silt loam in the upper part; brown, mottled clay in the middle part; and yellowish brown, mottled clay in the lower part. The underlying material is grayish brown and dark yellowish brown clay.

Mexico soils are gently sloping and somewhat poorly drained. They are on the crests of upland divides and on long side slopes. Typically, the surface layer is very dark grayish brown silt loam. The subsurface layer is brown silt loam. The subsoil is silty clay loam in the upper part and silty clay in the lower part. It has mottled colors of dark grayish brown, yellowish brown, and red. The underlying material is grayish brown and dark yellowish brown silty clay loam.

The Hatton soils are moderately sloping and moderately well drained. They are on rounded ridge crests. Typically, the surface layer is dark brown silt loam, and the subsurface layer is brown silt loam. The subsoil is yellowish brown silt loam and silty clay loam in the upper part; dark brown, mottled silty clay loam in the middle part; and strong brown, mottled silty clay loam in the lower part. The underlying material is strong brown, mottled silty clay loam and yellowish red, mottled clay loam.

The minor soils in this association are in the Keswick, Lindley, Goss, Auxvasse, and Haymond series. The strongly sloping Keswick soils are on side slopes of ridges; the well drained Lindley and Goss soils are on moderately steep to steep side slopes; the poorly drained Auxvasse soils are on terraces, and the well drained Haymond soils are on stream bottoms.

About 70 percent of the acreage of this association has been cleared. Most of the cleared areas on hillsides are used for pasture. Corn, soybeans, and wheat are commonly grown on the broad, gently sloping to moderately sloping ridgetops and side slopes. The uncleared acreage consists of uneven, moderately steep to steep areas that are generally in mixed hardwoods. Livestock production is a major enterprise.

Control of water erosion and improving and maintaining fertility and tilth are the main concerns of management for crops. Minimum tillage, winter cover crops, and grassed waterways help to prevent excessive soil loss. Many areas have slopes that are long and smooth enough for terracing and farming on the contour. The return of crop residue to the soil or the regular addition of organic matter helps to maintain fertility and improves tilth.

The use of these soils for pasture or hay is also effective in controlling erosion. Overgrazing is a major concern of management because of the resulting erosion. In areas that do not have flowing water, ponds provide water for livestock.

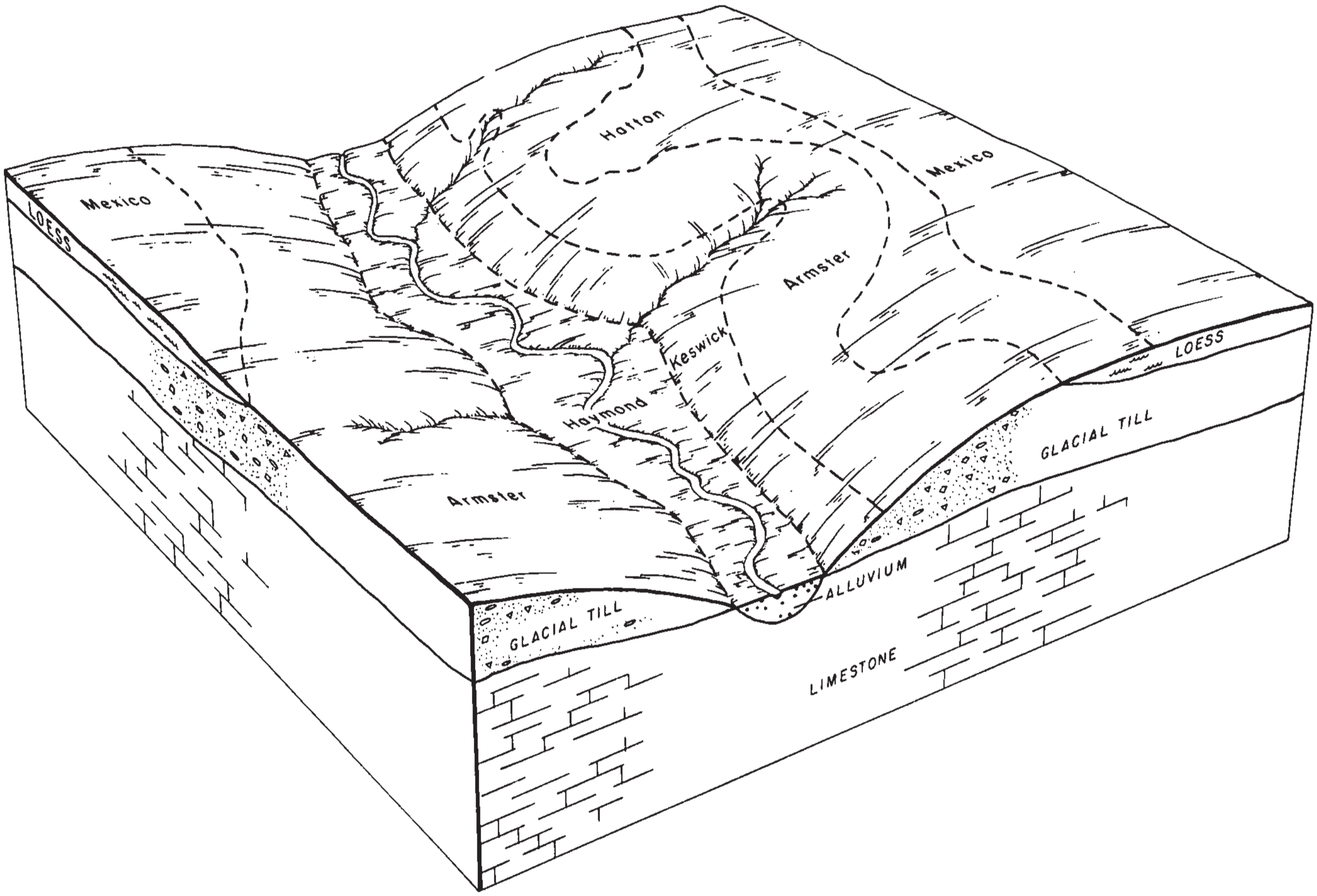


Figure 1.—Typical pattern of soils and underlying material in the Armster-Mexico-Hatton association.

The soils in this association are suitable for trees. Only those areas that are too steep or uneven to be practical for farming remain in woodland. Existing stands are predominantly oak and hickory. Productivity is moderate.

These soils are suitable for building sites and sanitary facilities. The high shrink-swell potential of the clayey subsoil is a severe limitation that must be overcome for building sites. The slow permeability of these soils makes them poorly suited to septic tanks. They are generally better suited to sewage lagoons for waste disposal.

2. Menfro-Harvester-Weller association

Nearly level to steep, well drained and moderately well drained soils formed in loess and silty fill material; on uplands

This association consists of soils formed in loess and silty fill material on uplands adjacent to the flood plains of the Missouri and Mississippi Rivers. These uplands are generally steep and deeply dissected in areas immediately adjacent to the Missouri River flood plain (fig. 2).

This association covers about 22 percent of the county. It is about 44 percent Menfro soils, 23 percent Harvester soils, and 23 percent Weller soils. The remaining 10 percent is minor soils.

Menfro soils are gently sloping to steep and well drained. They are on ridgetops and convex side slopes. In most places, they are between Weller soils and soils on the Missouri and Mississippi River flood plains. Menfro soils are uniformly brown and are silt loam in the surface layer, silt loam and silty clay loam in the subsoil, and silt loam in the underlying material.

Harvester soils are gently sloping to strongly sloping and moderately well drained. They formed in silty loess materials on ridges and the upper part of side slopes. The upper 20 to 40 inches of the original soil has been

transported and shaped by earth moving equipment for use in other places. Typically, the remaining surface layer is brown silt loam and is underlain by alternating layers of multicolored silt loam and silty clay loam.

The Weller soils are nearly level to moderately sloping and moderately well drained. They are mainly on the upper side slopes and ridgetops. Typically, the surface layer is dark brown silt loam. The subsoil is dark yellowish brown silty clay loam in the upper part; dark yellowish brown, mottled silty clay in the middle part; and brown, mottled silty clay loam in the lower part.

The minor soils in this association are in the Herrick, Kennebec, and Dockery series. The somewhat poorly drained Herrick soils are on broad, gently sloping ridges and nearly level terraces; the very dark gray Kennebec soils and the somewhat poorly drained Dockery soils are on small stream bottoms.

Most of the acreage of this association has been cleared and used for cultivated crops, hay, and pasture. Many areas are being used for urban and suburban development. Livestock farming is a major enterprise, and nearly all of the dairy farms in the county are located in this area. The uncleared acreage consists mainly of steep, uneven areas that are in mixed hardwoods.

Control of water erosion and improving and maintaining fertility and tilth are the main concerns of management for crops. Minimum tillage, winter cover crops, and grassed waterways help to control erosion. Many areas have slopes that are long and smooth enough for terraces and farming on the contour. Gullies can be shaped and seeded to grass. The return of crop residue to the soil or the regular addition of organic matter helps to maintain and improve fertility and tilth.

The use of these soils for pasture or hay is also effective in controlling erosion. Overgrazing is a major concern of management because of the erosion hazard. In areas that do not have flowing water, ponds provide water for livestock.

The soils in this association are well suited to trees. The well drained soils on uplands are well suited to orchards and vineyards. In general, only those areas that

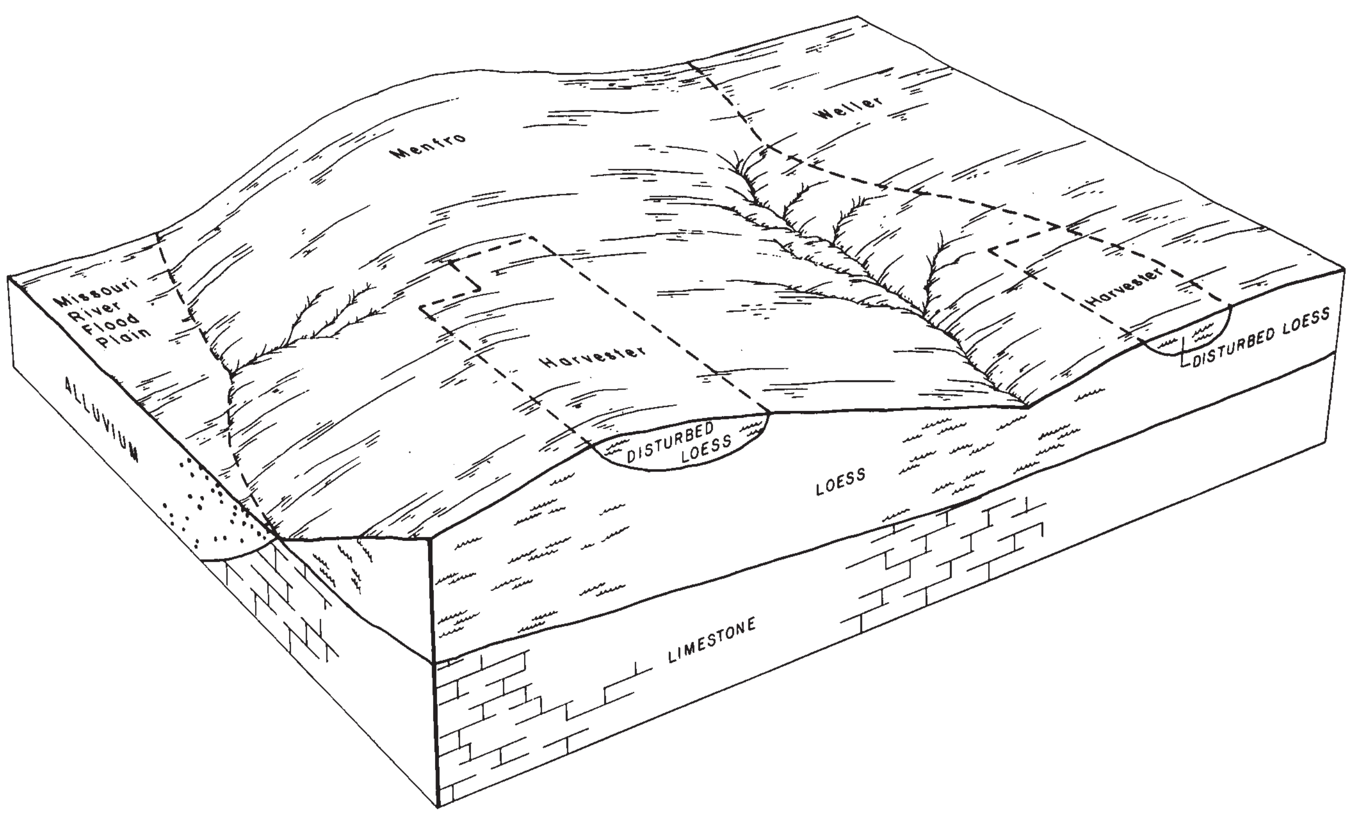


Figure 2.—Typical pattern of soils and underlying material in the Menfro-Harvester-Weller association.

are too steep or uneven to be practical for farming remain in woodland. Existing stands which are predominantly oak and hickory need improvement.

This association is well suited to sanitary facilities and building sites. It is rapidly becoming an urban area, and many acres have been converted from agricultural uses to urban and suburban development. The major concerns of management are the erosion of construction sites and the moderate to high shrink-swell potential of the subsoil.

3. Portage-Carlow-Kampville association

Nearly level, very poorly drained to somewhat poorly drained soils formed in clayey and silty alluvium; on flood plains

This association consists of soils on the Mississippi River flood plain. Differences in the soils are largely a result of the texture of the materials in which they formed. Differences in elevation are slight. In general, the lowest areas are along the river channel, but the landscape inclines gradually toward the surrounding uplands (fig. 3).

This association covers about 15 percent of the county. It is about 32 percent Portage soils, 31 percent Carlow soils, and 9 percent Kampville soils. The remaining 28 percent is minor soils.

The Portage soils are very poorly drained. They are in broad depressional areas. The surface layer is black clay. The subsurface layer is very dark gray clay in the upper part and very dark grayish brown clay in the lower part. The subsoil is dark gray and dark grayish brown clay.

The Carlow soils are poorly drained. They are in low lying areas and on low natural levees. Typically, the surface layer is very dark grayish brown silty clay loam.

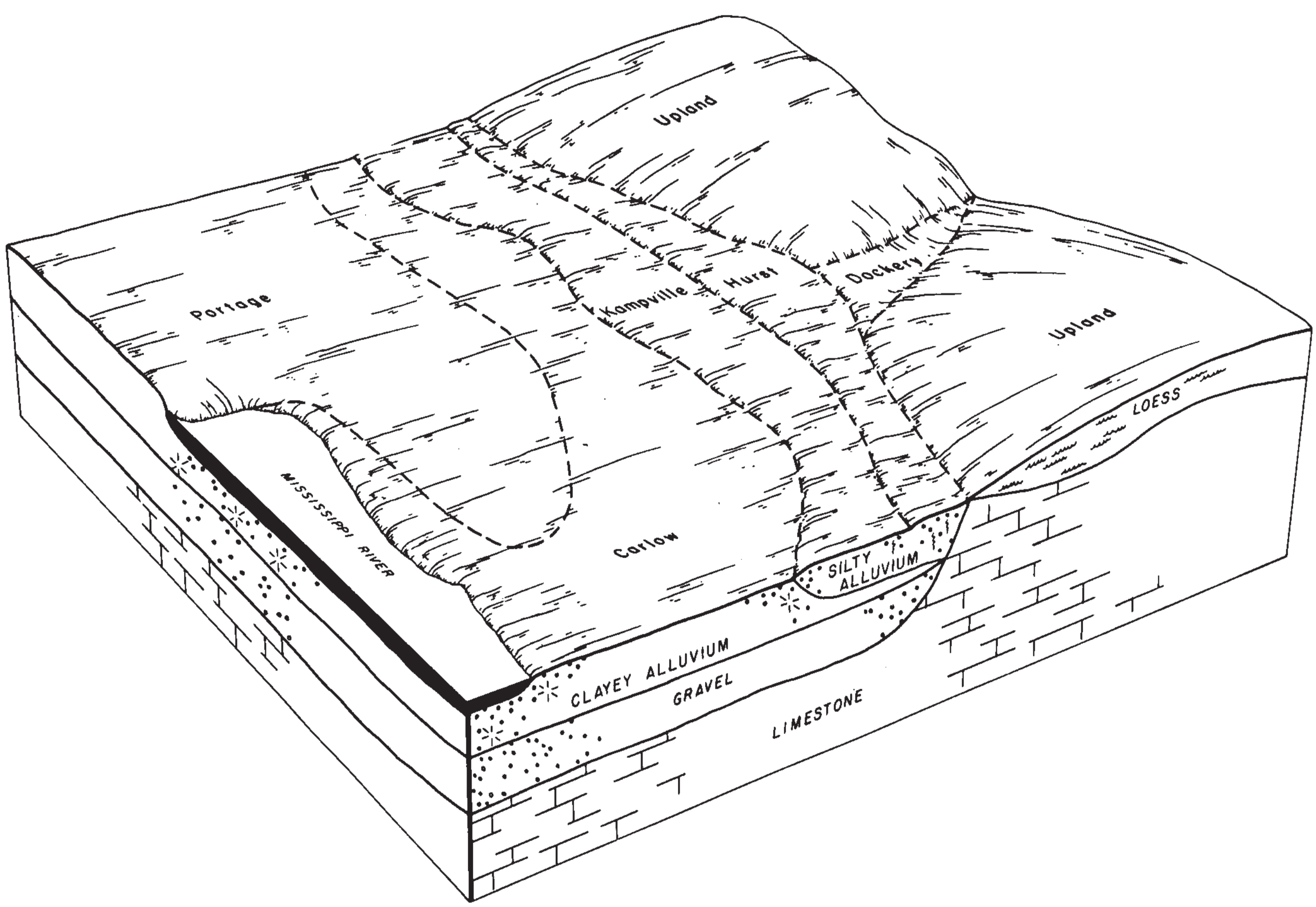


Figure 3.—Typical pattern of soils and underlying material in the Portage-Carlow-Kampville association.

The subsurface layer is very dark grayish brown silty clay. The subsoil and underlying material are dark gray silty clay.

The Kampville soils are somewhat poorly drained. They are on low natural levees. Typically, the surface layer is dark grayish brown silt loam. The subsurface layer is grayish brown silt loam. The subsoil is grayish brown and dark grayish brown, mottled silty clay loam. The underlying material is grayish brown, mottled silty clay loam.

Minor soils in this association are in the Hurst, Dupo, Dockery, and Chequest series. The somewhat poorly drained Hurst soils are on low terraces bordering the uplands; the silty Dupo and Dockery soils are on alluvial fans along drainageways bordering loess-covered uplands; and the poorly drained Chequest soils are on low natural levees.

Most of the acreage of this association is used for cultivated crops, mainly soybeans and wheat. Many areas near the Mississippi River that flood frequently remain in woodland. Some areas are leveed and flooded in the fall to provide shallow water habitat for migratory waterfowl.

Wetness is the major concern in management for crops. Artificial drainage is needed to remove excess water. Row crop varieties that require a short growing season generally grow well because of the wet conditions during the spring and fall.

These soils are suitable for trees. Many low-lying areas along the major rivers and on islands remain in woodland. Cottonwood, black willow, and silver maple are predominant. Wetness is a severe limitation to the use of equipment.

This association is generally unsuitable for sanitary facilities and building sites. Wetness, flooding, and the high clay content are the main limitations.

4. Haynie-Blake-Waldron association

Nearly level, well drained and somewhat poorly drained soils formed in silty, loamy, and clayey alluvium; on flood plains

This association consists of soils on the Missouri River flood plain. Differences in the soils are largely a result of the texture of the material in which they formed. Differences in elevation are slight. In general, the silty soils are in the highest positions on the landscape, and the clayey soils are in the lowest positions (fig. 4).

This association makes up about 15 percent of the county. It is about 26 percent Haynie soils, 26 percent Blake soils, and 16 percent Waldron soils. Minor soils make up the remaining 32 percent.

The Haynie soils are well drained. They are mainly on ridges and natural levees on the flood plain. Typically, the surface layer is very dark grayish brown silt loam. The underlying material is dark grayish brown very fine sandy loam and pale brown loamy very fine sand.

The Blake soils are somewhat poorly drained. They are on low ridges and in drainageways and swales. Typically, the surface layer is very dark grayish brown silty clay loam. The underlying material is stratified dark grayish brown silty clay loam and very fine sandy loam.

The Waldron soils are somewhat poorly drained. They are in low-lying drainageways and depressional areas. Typically, the surface layer is very dark grayish brown silty clay. The underlying material is dark grayish brown and grayish brown silty clay.

Minor soils in this association are in the Hodge, Carr, Lomax, and Booker series. The somewhat excessively drained, sandy Hodge soils are in high sandy areas; the well drained, fine sandy loam Carr soils are on high natural levees and ridges; the well drained Lomax soils are on terraces, and the very poorly drained, clayey Booker soils are in low-lying slackwater areas.

The soils of this association are intensively cultivated. Corn, soybeans, and wheat are the main crops. A small acreage remains in woodland, mainly in areas next to the Missouri River channel that are not protected from flooding.

The soils of this association are suited to row crops, small grains, and grasses and legumes. Wetness is the main concern of management. Surface drainage by ditches or land grading helps to remove excess water. These soils are well suited to supplemental irrigation, which increases the yields.

The soils in this association are suited to trees, but the only areas that are too wet or frequently flooded to be used for crops remain in woodland. Cottonwood is predominant. Pecans do well on these soils. Wetness is the main limitation in planting or harvesting trees.

This association is generally unsuitable for sanitary facilities and building sites because of wetness and the hazard of flooding.

5. Goss-Crider-Gatewood association

Moderately sloping to very steep, well drained soils formed in loess and residuum weathered from cherty dolomite, shale, and limestone; on uplands

This association consists dominantly of cherty and noncherty residual soils on hillsides, ridgetops, and foot slopes. Differences in elevation of 250 feet or more within one-fourth mile are common. Valleys are deep and narrow and generally no more than one-fourth mile wide (fig. 5).

This association occupies about 14 percent of the county. It is about 28 percent Goss soils, 27 percent Crider soils, and 25 percent Gatewood soils. The remaining 20 percent is minor soils.

Goss soils range from moderately sloping to very steep. They generally are steep and very steep on

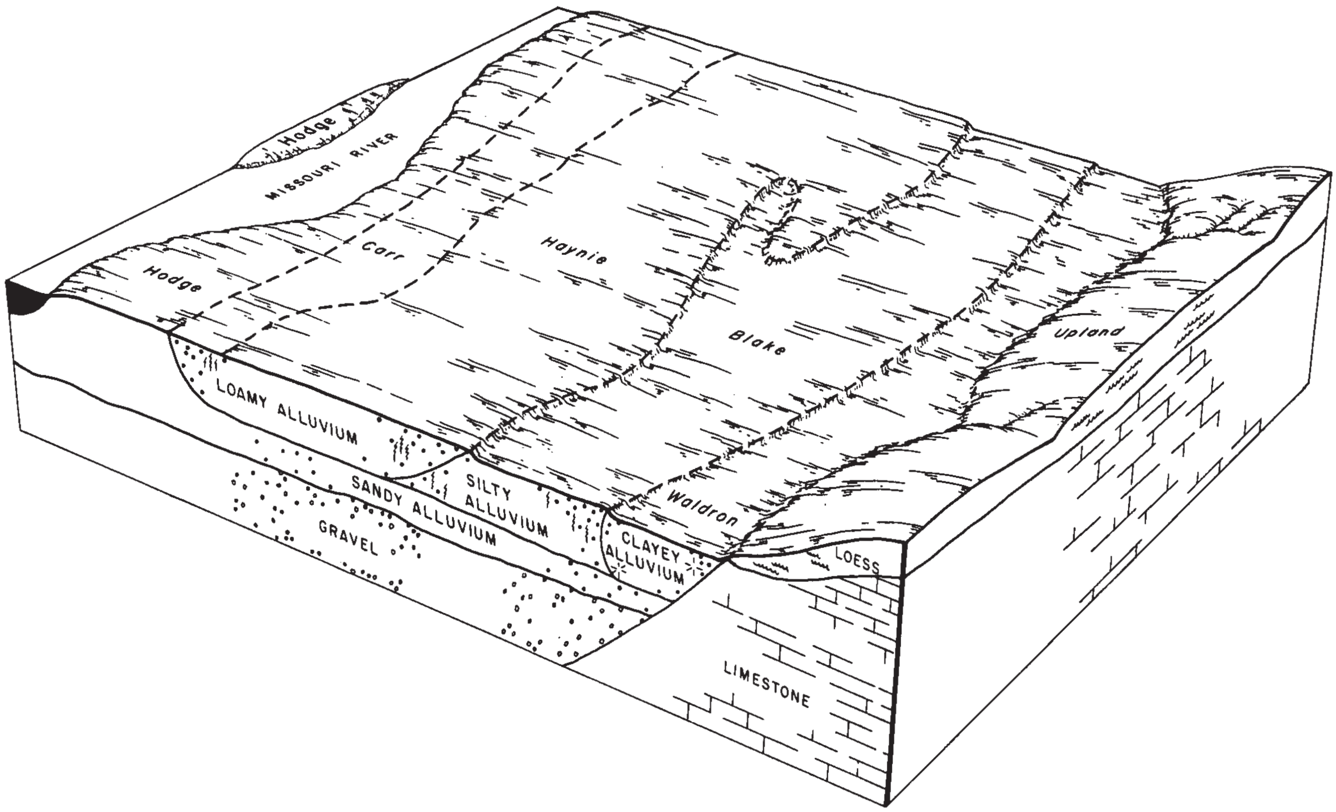


Figure 4.—Typical pattern of soils and underlying material in the Haynie-Blake-Waldron association.

south-facing hillsides and are moderately and strongly sloping on ridge points and narrow ridge crests. Typically, the surface layer is brown cherty silt loam, and the subsurface layer is yellowish brown cherty silt loam. The subsoil is strong brown cherty silt loam in the upper part, yellowish red and red cherty and very cherty silty clay in the middle part, and strong brown very cherty silty clay in the lower part.

Crider soils range from moderately sloping to moderately steep. They are strongly sloping and moderately steep on ridge crests and north-facing hillsides and are moderately sloping on some foot slopes below Goss soils. Typically, the surface layer is dark brown silt loam. The subsoil is strong brown, brown, and dark yellowish brown silty clay loam in the upper part and yellowish red and red silty clay loam in the lower part.

Gatewood soils are in a complex with Gasconade and Crider soils. They are moderately steep to very steep. Generally, they are on north-facing side slopes, downslope from Goss soils. Typically, the Gatewood soils have a surface layer of very dark grayish brown silt loam. The subsoil is brown silty clay in the upper part and strong brown clay in the lower part. Limestone bedrock is at a depth of about 24 inches.

Minor soils in this association are in the Gasconade, Cedargap, Sensabaugh, Holstein, Menfro, Weller, and Winfield series. The somewhat excessively drained, shallow Gasconade soils and rock outcrops are on south-facing side slopes; the somewhat excessively drained Cedargap soils and the moderately well drained Sensabaugh soils are on small stream bottoms; the well drained Holstein soils are on foot slopes below sandstone outcrops; the well drained, brown Menfro soils and the moderately well drained Weller and Winfield soils are on ridgetops and toe slopes.

About 70 percent of the soils in this association

remain in native hardwood forest, predominantly oak and hickory. The cleared areas, which are mainly on ridgetops, foot slopes, and stream bottoms, are used for cultivated crops, hay, and pasture.

The forested acreage consists of areas so steep or cherty that it is not practical to clear and farm them. These existing stands need improvement to obtain best production. The steep slopes restrict the use of logging equipment and cause an erosion hazard along logging roads and skid trails.

The less sloping soils are mostly cleared and are suitable for livestock farming, which is the major farm enterprise. Slope and the hazard of erosion are the main limitations. Droughtiness of the bottom land in this association restricts the growth of row crops.

This association is suited to sanitary facilities and to low-density building sites. The steep slopes, depth to bedrock, and chert in the soils are the main limitations.

6. Dockery-Haymond-Sensabaugh association

Nearly level, somewhat poorly drained and well drained soils formed in silty and cherty, loamy alluvium; on flood plains

This association consists of soils on flood plains along creeks and small drainageways.

This association covers about 9 percent of the county. It is about 44 percent Dockery soils, 16 percent Haymond soils, and 13 percent Sensabaugh soils. The remaining 27 percent is minor soils.

Dockery soils are somewhat poorly drained. They are on large creek bottoms in the loessial hill areas and in pockets and cut-off stream meanders along the drainageways of other areas. Typically, the surface layer is dark brown silt loam, and the underlying material is mottled, brown and grayish brown silt loam.

Haymond soils are well drained. They are higher than

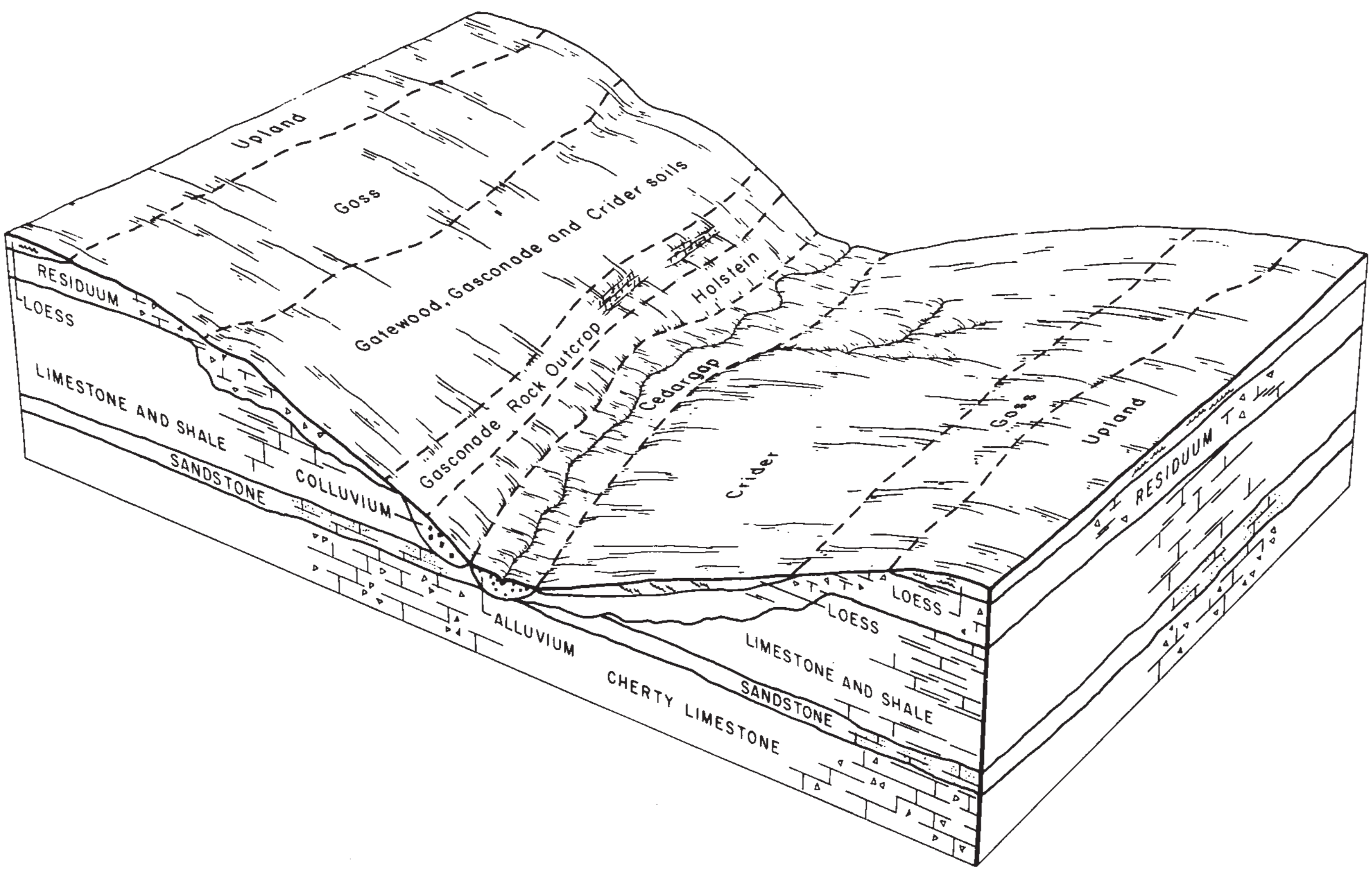


Figure 5.—Typical pattern of soils and underlying material in the Goss-Crider-Gatewood association.

Dockery and Sensabaugh soils along creek bottoms and drainageways. Typically, the surface layer is dark grayish brown silt loam. The underlying material is brown silt loam.

Sensabaugh soils are well drained. They are on small creek bottoms in the rocky and steep areas of the county and along stream channels on some of the large stream bottoms. Typically, the surface layer is dark brown silt loam. The subsoil is brown silt loam. The underlying material is dark reddish brown very cherty loam and brown very cherty sandy clay loam.

Minor soils in this association are in the Twomile, Auxvasse, Freeburg, and Westerville series. The poorly drained Twomile and Auxvasse soils are on high stream terraces, and the somewhat poorly drained Freeburg and Westerville soils are on low terraces.

Most soils of this association are intensively cultivated (fig. 6). Corn, soybeans, and wheat are the main crops. Meadow crops and pasture are less important. Flooding and wetness are the main management problems.

This association is generally unsuitable for sanitary facilities and for buildings sites because of the hazard of flooding. Any buildings should be located above known flood levels.

7. Lomax-Blase association

Nearly level, well drained and somewhat poorly drained soils formed in loamy, sandy, and clayey alluvium; on terraces

This association consists of a high terrace between the Missouri and Mississippi River flood plains. The terrace rises abruptly to its highest point along the Missouri River flood plain and slopes gradually toward the Mississippi River flood plain (fig. 7).

This association covers about 4 percent of the county. It is about 40 percent Lomax soils and 29 percent Blase soils. The remaining 31 percent is minor soils.

The Lomax soils are well drained. They are on the highest terrace positions bordering the Missouri River flood plain. Typically, the surface layer is very dark gray loam. The subsurface layer is very dark grayish brown

Figure 6.—Corn and a trailer park on Dockery silt loam near St. Charles. Urban development on flood plains is a primary concern in the county.

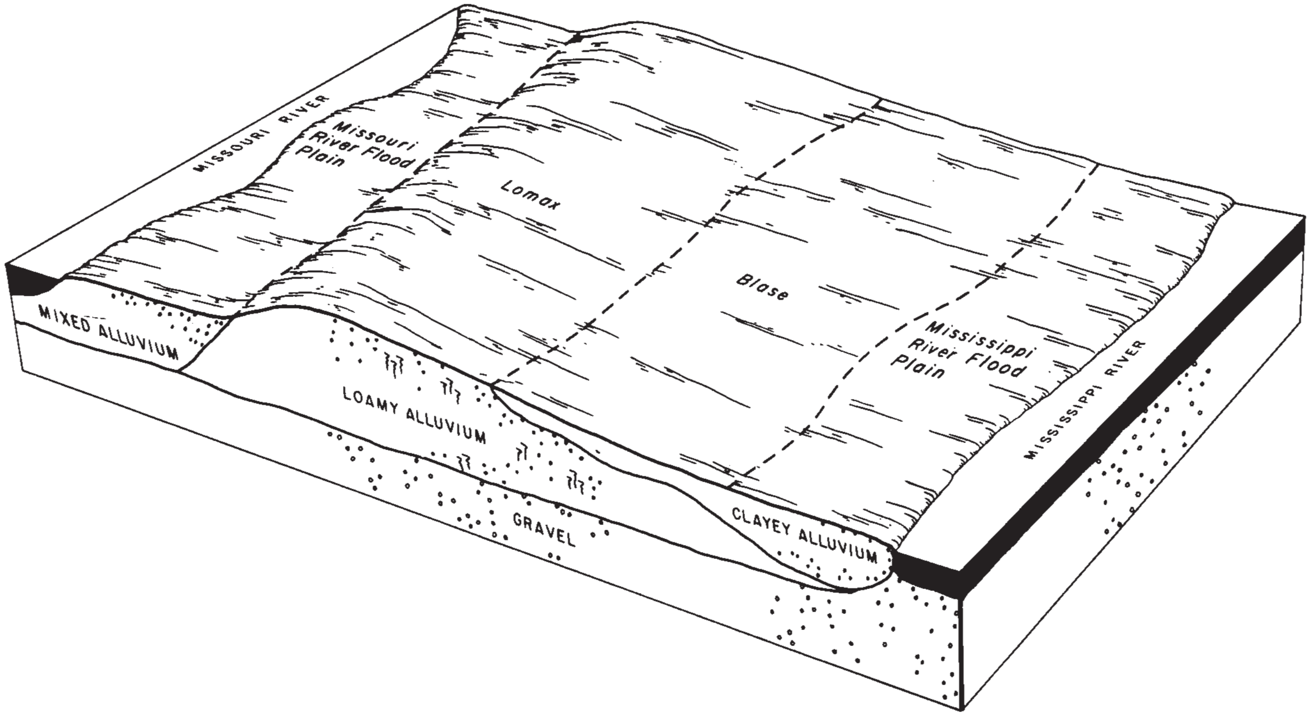


Figure 7.—Typical pattern of soils and underlying material in the Lomax-Blase association.

and dark brown very fine sandy loam. The subsoil is yellowish brown very fine sandy loam. The underlying material is pale brown loamy very fine sand.

The Blase soils are somewhat poorly drained. They are on terraces that slope toward the Mississippi River flood plain. Typically, the surface soil is very dark gray silty clay loam and silty clay. The subsoil is grayish brown silty clay. The underlying material is brown loam and very fine sandy loam.

The minor soils in this association are in the Booker, Waldron, and Blake series. The Booker soils are very poorly drained, and the Waldron and Blake soils are more clayey throughout. These soils are in drainageways that dissect the terraces.

The soils in this association are the most intensively cultivated in the county. Virtually all areas that are not used for farmsteads are in row crop and small grain production. A small acreage is used for vegetable farming. There are no major limitations to farming these soils (fig. 8).

Most areas of this association are unsuitable for sanitary facilities and building sites because of rare flooding. Onsite investigation and the previous flooding history are needed in any area considered for building sites. Because of the high value and potential of these soils for agricultural use, they have remained in that use.

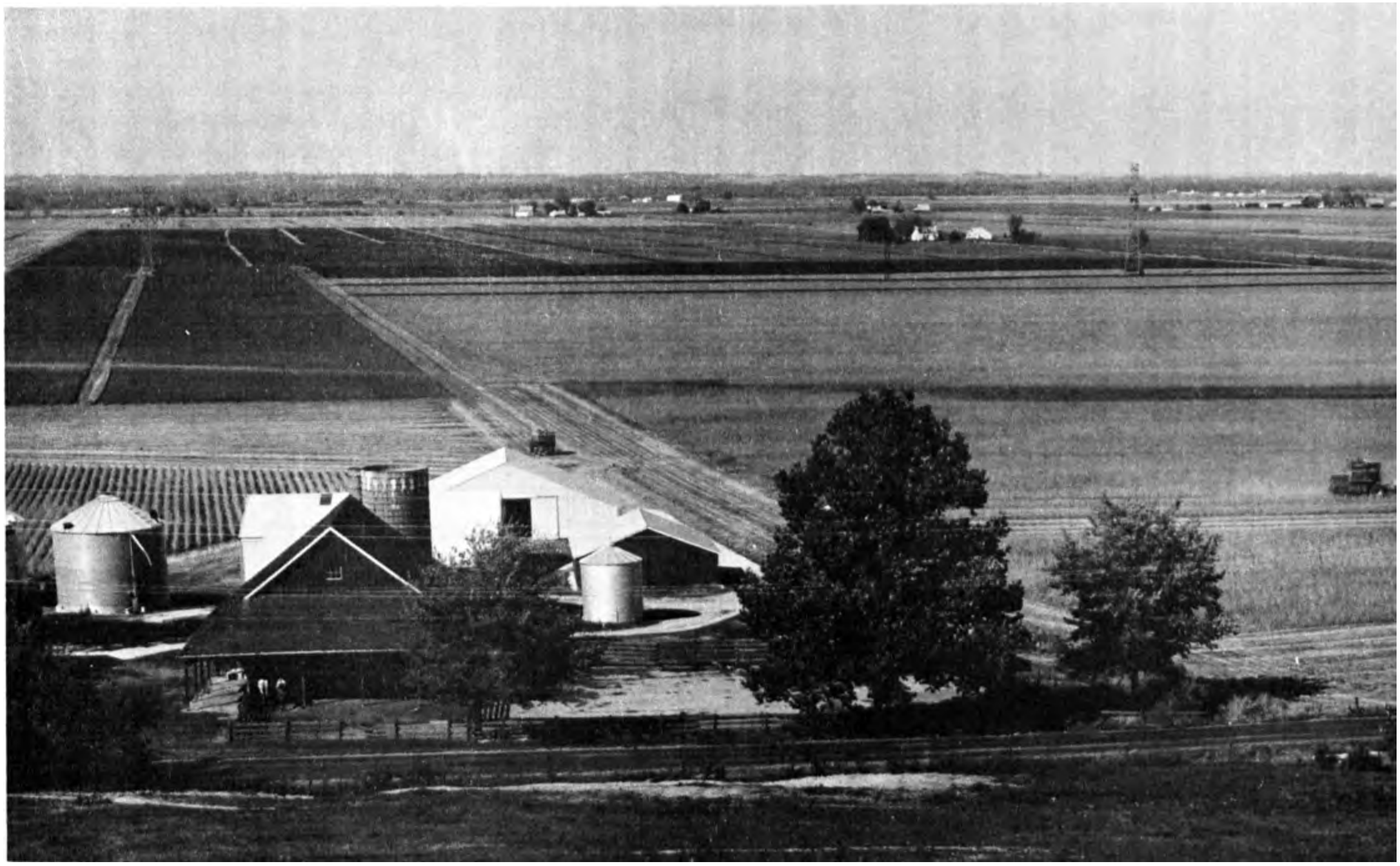


Figure 8.—A typical landscape in the Lomax-Blase association. This association is the most intensively cultivated area in the county.

detailed soil map units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and management of the soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series.* Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Menfro silt loam, 5 to 9 percent slopes, is one of several phases in the Menfro series.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Gatewood-Gasconade-Crider complex, 15 to 50 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, quarries is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

soil descriptions

2D—Goss silt loam, 5 to 14 percent slopes. This moderately sloping and strongly sloping, well drained soil is mainly on crests of narrow ridges. In some places it is on side slopes. Individual areas are irregular in shape and range from 5 to 25 acres.

Typically, the surface layer is dark brown silt loam about 4 inches thick. The subsurface layer is dark yellowish brown cherty silt loam about 12 inches thick. The subsoil which extends to a depth of 60 inches or more is red, firm cherty silty clay in the upper part and red, firm very cherty silty clay in the lower part. In some places, the surface layer is cherty.

Permeability of this Menfro soil is moderate, and surface runoff is rapid. The available water capacity is low. Shrinking and swelling are moderate. Reaction in the surface layer is medium acid or strongly acid except for a few limed areas and ranges from strongly acid to very strongly acid in the subsoil. Natural fertility is low, and the organic matter content is moderately low. The surface layer is difficult to till because of the high chert content within plow depth.

Nearly all areas of this soil are in woodland. A few areas have been cleared and are used for pasture. This soil is suited to trees for timber production. Chert is a moderate limitation to the use of tree planting equipment. It may be necessary to plant seedlings by hand. Existing timber stands can be improved by thinning and selective cutting of undesirable trees. New stands need protection from fire and overgrazing.

The landscape normally has a high esthetic value when it is used for low-density building. The soil is suited to low-density building if proper design and construction procedures are used. Dwellings can be designed to conform to the slope, but land shaping may be necessary in some areas. Large stones can be removed for dwellings. Footings and foundations should be adequately reinforced to prevent damage from shrinking and swelling of the soil.

Septic tank absorption fields are suitable for use on this soil if design and installation procedures overcome the moderate limitations of slope, permeability, and large stones. Generally, the land needs to be shaped and distribution lines need to be installed across the slope. The size of the filter field should be increased for necessary absorption of effluent. Using adequate base material and constructing the subgrade to shed water, as well as providing side ditches and culverts help prevent damage to local roads and streets caused by low soil strength and frost action. Some areas may need some cutting and filling to modify the slope.

This soil is in capability subclass VIs and woodland ordination 4f.

2F—Goss cherty silt loam, 14 to 35 percent slopes. This moderately steep to very steep, well drained soil is on long, uneven side slopes. Individual areas are irregular in shape and range from 10 to several hundred acres.

Typically, the surface layer is brown cherty silt loam about 3 inches thick. The subsurface layer is yellowish brown cherty silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches or more. It is strong brown, friable cherty silt loam in the upper part; yellowish red and red, firm cherty and very cherty silty clay in the middle part; and strong brown, firm very cherty silty clay in the lower part. In some areas near the Missouri River, the surface layer is up to 20 inches of silt loam.

Included with this soil in mapping are small areas of moderately deep Gatewood soils and shallow Gasconade soils on short, steep bluffs at the base of some side slopes. Noncherty Menfro and Crider soils are on north-facing side slopes along the Missouri River. Also included are small areas of nearly level Cedargap soils along narrow drainageways. Total inclusions make up less than 10 percent of the unit.

Permeability of this Goss soil is moderate, and surface runoff is rapid. The available water capacity is low. Shrinking and swelling are moderate. Reaction is medium acid or strongly acid in the surface layer and strongly acid or very strongly acid in the subsoil. Natural fertility is low, and the organic matter content is moderately low. The surface layer is very difficult to till because of the high chert content.

Nearly all areas of this soil are in woodland. This soil is suited to trees, and most areas remain in native hardwoods. The planting of trees is limited somewhat by stones and droughtiness. It may be necessary to plant seedlings by hand and use special planting stock of a larger size than normal to achieve better stands. The steep slopes are a severe limitation for equipment usage when harvesting trees. Roads and skid trails should be constructed on the contour. In these steep areas, logs can be yarded uphill to logging roads and skid trails. Most existing stands need thinning and selective cutting of undesirable trees. New stands need protection from fire and overgrazing. These practices also improve the habitat for woodland wildlife, especially white-tailed deer and wild turkey (fig. 9).

Figure 9.—Goss cherty silt loam, 14 to 35 percent slopes, is the main source of white oak timber in the county.

This Goss soil is generally not suited to building sites and septic tank absorption fields because of steep slopes. This soil can be made suitable for low-density building by extensive site preparation, but the cost of such preparation can be restrictive.

This soil is in capability subclass VIIs and woodland ordination 4f.

3—Twomile silt loam. This nearly level, poorly drained soil is on stream terraces. Individual areas are irregular in shape and range from 5 to 25 acres. This soil is rarely flooded.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsurface layer is silt loam about 22 inches thick. The upper part is grayish brown, and the lower part is light brownish gray. It is firm and compact in the lower 10 inches. The subsoil extends to a depth of 60 inches or more. It is dark grayish brown firm silty clay loam in the upper part and grayish brown firm silty clay loam in the lower part.

Permeability and surface runoff are slow. The available water capacity is moderate. A seasonal high water table is at a depth of 1 foot to 2 feet during winter and spring. Shrinking and swelling are moderate. Reaction ranges from very strongly acid to medium acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled. Root development is restricted below a depth of about 18 inches by a compact and dense layer.

Most areas of this soil are farmed, although spring tillage is often delayed by wetness. This soil is suited to cultivated crops and grasses and legumes for hay and pasture. Summer annuals and deep-rooted legumes, such as alfalfa, generally grow poorly because their roots are restricted by a dense, compact layer. Irrigation, where practical, helps to increase yields. Small grains and cool-season grasses are the best crops for unirrigated areas of this soil.

Pasture and hay mixtures that contain summer drought-resistant varieties grow well on this soil. There is also a wetness problem late in winter and early in spring because of slow internal drainage. Overgrazing or grazing during wet periods causes surface compaction and poor soil tilth. Proper stocking, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, although few areas remain in woodland. Tree seeds and seedlings survive and grow well if competing vegetation is removed or controlled. This can be accomplished through site preparation. Because wetness severely limits the use of equipment, it should be scheduled for use in the dry summer months or in winter when the ground is frozen.

This soil is generally not suitable for building sites and for septic tank absorption fields because of the seasonal high water table and the rare flooding in low-lying areas.

This soil is in capability subclass IIIw and woodland ordination 3w.

4D—Menfro-Goss silt loams, 9 to 14 percent slopes. This map unit consists of strongly sloping, well drained soils on long, narrow, upland ridge crests. It is about 50 percent Menfro soils and 45 percent Goss soils. Individual areas are irregular in shape and range from 5 to 100 acres. The Menfro soils are on convex points of ridges and on the broader, flatter parts of the ridge. The Goss soils are on concave saddles of the ridge and in the narrower, steeper areas as well as on the tapering ends of the ridge. These soils are so intermingled that they could not be shown separately at the scale selected for mapping.

Typically, the Menfro soil has a surface layer of dark yellowish brown silt loam about 5 inches thick. The subsoil is brown silty clay loam about 33 inches thick. The underlying material to a depth of about 60 inches or more is brown and dark yellowish brown silt loam.

Typically, the Goss soil has a surface layer of brown silt loam about 4 inches thick. The subsurface layer is dark yellowish brown cherty silt loam about 12 inches thick. The subsoil, extending to a depth of 60 inches or more, is red, firm cherty silty clay in the upper part and red, firm very cherty silty clay in the lower part. In some places, the surface layer is cherty. Also, in places, the red subsoil does not have chert.

Permeability of the Menfro and Goss soils is moderate, and surface runoff is rapid. The available water capacity is high in the Menfro soil and low in the Goss soil. Shrinking and swelling in both soils are moderate. Reaction in both soils ranges from slightly acid to strongly acid in the surface layer and from slightly acid to very strongly acid in the subsoil. Natural fertility is medium in the Menfro soil and low in the Goss soil. The organic matter content is moderately low in both soils. The high chert content within plow depth makes the Goss soil difficult to till, but the surface layer of the Menfro soil is friable and easily tilled.

Nearly all areas of these soils are in woodland, although a few areas have been cleared and are used as pasture. These soils are suited to trees. Existing stands need thinning and cutting to remove undesirable trees. New stands need protection from fire and overgrazing. The use of tree planting equipment on the Goss soil is moderately limited by chert. It may be necessary to plant seedlings by hand.

The soils in this map unit are suited to building sites and septic tank absorption fields if proper design and installation procedures are used. Dwellings can be designed to fit the slope, or areas can be modified by land shaping. Footings, foundations, and basement walls should be adequately reinforced to prevent structural damage from shrinking and swelling of the soil. Installing drainage tile around footings helps prevent excessive wetness if surface drainage is poor and gutters fail. Sewage distribution lines generally need to be installed across the slope for proper operation of the absorption field on both Menfro and Goss soils. Some chert and stones can be removed and the absorption field enlarged to overcome the moderate permeability of the Goss soil.

These soils do not have sufficient strength to support vehicular traffic, but this can be corrected by adding crushed rock or other suitable material to the road base. Constructing the subgrade to shed water, as well as providing side ditches and culverts helps prevent damage from frost action. Some cutting and filling may be needed to modify the slope.

This complex is in capability subclass IVe, and the woodland ordination is 3o for Menfro soils and 4f for Goss soils.

6C—Crider silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on upland side slopes. Individual areas are irregular in shape and range from 5 to 40 acres.

Typically, the surface layer is very dark grayish brown silt loam about 5 inches thick. The subsurface layer is dark yellowish brown silt loam about 5 inches thick. The subsoil is firm silty clay loam that extends to a depth of 60 inches or more. The upper part is brown, the middle part is strong brown, and the lower part is yellowish red.

Included with this soil in mapping are some areas of a soil with a high content of chert in the middle and lower part of the subsoil. This soil generally is on the lower end of the side slope and makes up 3 to 10 percent of the unit.

Permeability of this Crider soil is moderate. The available water capacity is high. Surface runoff is medium. Reaction ranges from slightly acid to strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. The surface layer is friable and easily tilled. The organic matter content is moderate, and natural fertility is medium.

Most areas of this soil are in pasture. This soil is suited to corn, soybeans, and small grains if erosion is controlled. Minimum tillage, winter cover crops, and grassed waterways help control erosion. In some areas slopes are long and smooth enough for terraces and farming on the contour. Proper management of crop residue and green manure crops help control erosion, maintain and improve organic matter content and tilth, and increase water infiltration.

This soil is suited to grasses and legumes for hay and pasture. Overgrazing and grazing when the soil is too wet cause surface compaction, poor tilth, and excessive runoff. Proper stocking, pasture rotation, and restricted use during wet periods help to maintain pasture productivity and prevent excessive soil loss.

This soil is suited to trees, although few areas remain in woodland. There are only slight limitations for planting and harvesting trees.

This soil is well suited to dwellings and small buildings and to septic tank absorption fields. It does not have sufficient strength to support vehicular traffic, but this can be corrected by adding crushed rock or other suitable material to the road base.

This soil is in capability subclass IIIe and woodland ordination 3o.

6D2—Crider silt loam, 9 to 14 percent slopes, eroded. This strongly sloping, well drained soil is on narrow, convex ridgetops and side slopes. Individual areas are irregular in shape and range from 5 to 50 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. It is strong brown, brown, and dark yellowish brown, firm silty clay loam in the upper part; yellowish red, firm silty clay loam in the middle part; and red silty clay loam in the lower part. In a few areas the subsoil is not as red and has gray mottles in the lower part.

Included with this soil in mapping are small areas of moderately well drained Keswick soils around the heads of small drainageways. Also included are small areas of cherty Goss soils on short, steep side slopes. Total inclusions make up 10 to 15 percent of the unit.

Permeability of this Crider soil is moderate. Surface runoff is rapid. The available water capacity is high. Natural fertility is medium, and the organic matter content is moderate. Reaction ranges from medium acid to strongly acid in the upper subsoil and varies widely in the surface layer due to local liming practices. The surface layer is friable and easily tilled. It does, however, have a tendency to crust after hard rains because some of the subsoil is mixed into the surface layer.

Most areas of this soil are in pasture or woodland. Where the size and shape of the area makes it practical, this soil is suited to occasional, but not regular, cultivation. If this soil is used for cultivated crops, there is a severe erosion hazard. Terraces, grassed waterways, minimum tillage, and suitable crop rotations help to prevent excessive soil loss. Because this soil is highly susceptible to gullying, careful design and maintenance of waterways is critical. The return of crop residue to the soil and the addition of manure improve fertility and increase water infiltration.

The use of this soil for pasture or hay is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes soil compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good shape.

This soil is suited to trees, and some areas remain in native hardwoods, dominantly oaks. Seedlings survive and grow well if competing vegetation is removed or controlled. This can be accomplished by site preparation or by prescribed burning or cutting. Existing timber stands need thinning and selective cutting of diseased, damaged, or undesirable species.

This soil is suitable for building sites and septic tank absorption fields if proper design and installation procedures are used to overcome moderate slope

limitations. Dwellings can be designed to conform to the natural slope of the land, and sewage distribution lines need to be installed across the slope for the proper function of absorption fields. Land shaping may be necessary in some areas.

This soil does not have sufficient strength to support vehicular traffic, but this can be corrected by adding crushed rock or other suitable material to the road base.

This soil is in capability subclass IIIe and woodland ordination 3o.

6E—Crider silt loam, 14 to 20 percent slopes. This moderately steep, well drained soil is on convex, upland side slopes. Individual areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown and strong brown, firm silty clay loam, and the lower part is reddish brown silty clay loam. In some places the lower part of the subsoil is not as red and has gray mottles.

Included with this soil in mapping is about 10 percent cherty Goss soils on the short, steep, lower side slopes.

Permeability of this Crider soil is moderate, and surface runoff is rapid. The available water capacity is high. Reaction ranges from medium acid to strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is medium, and the organic matter content is moderate. The surface layer is friable and easily tilled. It does have a tendency to crust after heavy rains, especially where the subsoil has been mixed into the surface layer.

Most areas of this soil are in pasture or woodland. This soil is generally not suited to use as cropland because of steep slopes and should only be tilled when needed for reseeding pasture and hay. When grasses and legumes are grown, the use of minimum tillage is helpful in controlling erosion. Seed should be planted early enough to establish good ground cover before the end of the growing season. Nurse crops can be planted to provide cover late in fall and in winter until the grasses and legumes are established.

Because of the steep slope, a vigorous stand of grasses and legumes should be maintained to control runoff. Overgrazing should be avoided. Good management practices include pasture rotation, proper stocking, fertility maintenance, and restricted use during wet periods.

This soil is suited to trees, and many areas have stands of native hardwoods, predominantly oak. Steep slope and the erosion hazard are moderate limitations to planting and harvesting trees. These limitations can be overcome to some extent by the timely use of equipment when the soil is dry and firm. Roads and skid trails should be constructed to minimize the steepness and length of slope. Seeding disturbed areas may be necessary after harvesting. Tree seedlings grow well if competing vegetation is removed or controlled. This may be accomplished by prescribed burning or spraying or cutting. Existing timber stands need selective cutting and thinning of undesirable trees. New stands need protection from fire and overgrazing. These practices also improve the habitat for woodland wildlife, especially white-tailed deer and wild turkey.

This soil is suitable for building sites and septic tank absorption fields, but steep slopes are a severe limitation. The difficulty of using equipment and the cost of preparing the site for construction and of designing buildings, septic tank absorption fields, and roads to fit the land can be prohibitive. If this soil is used for building sites, runoff needs to be reduced or diverted. Local roads need adequate base material to prevent damage from low strength.

This soil is in capability subclass IVe and woodland ordination 3r.

7B—Menfro silt loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on high, loess-covered terraces and ridgetops. Most individual areas are irregular in shape and range from 10 to 40 acres.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 45 inches thick. It is brown silt loam in the upper part and dark yellowish brown and yellowish brown silty clay loam in the lower part. In some areas on the lower side slopes, gray mottles are in the lower part of the subsoil. In other areas the natural soil has been disturbed by development.

Permeability of this Menfro soil is moderate, and runoff from cultivated areas is medium. The available water capacity is high. Shrinking and swelling are moderate. Reaction ranges from strongly acid to slightly acid in the subsoil and varies in the surface layer as a result of liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled throughout a wide range in moisture content. There are no restrictions to root development.

Most areas of this soil are used for cultivated crops, pasture, and hay. Many small areas are homesites. This soil is suited to corn, soybeans, small grains, and to grasses and legumes for pasture and hay. Where the soil is cultivated, there is an erosion hazard. Minimum tillage and suitable crop rotation help prevent excessive soil loss. In most places, slopes are not long enough to require terracing. The use of crop residue and barnyard manure improves fertility and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during

wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. There are only slight hazards or limitations for planting or harvesting trees.

This soil is suitable for building sites and septic tank absorption fields if proper design and installation procedures are used. Damage from shrinking and swelling can be reduced by using adequate reinforcement in footings, basement walls, and floors. Installing drainage tile around footings helps prevent excessive wetness around foundations where surface drainage is poor and gutters fail. Excessive seepage from sewage lagoons can be prevented by sealing the bottom of the lagoon. This soil does not have sufficient strength to support vehicular traffic, but this can be corrected by adding crushed rock or other suitable material to the road base. Constructing the subgrade to shed water, as well as providing side ditches and culverts, helps prevent damage from frost action.

This soil is in capability subclass IIe and woodland ordination 3o.

7C—Menfro silt loam, 5 to 9 percent slopes. This moderately sloping, well drained soil is on convex ridgetops. Individual areas are branched and irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of about 59 inches. The upper part is brown silt loam, the middle part is brown silty clay loam, and the lower part is brown silt loam. The underlying material to a depth of 67 inches or more is dark yellowish brown silt loam. In some areas on the lower side slopes, gray mottles are in the lower part of the subsoil. In other areas the natural soil has been disturbed by development.

Permeability of this Menfro soil is moderate, and surface runoff from cultivated areas is medium. The available water capacity is high. Shrinking and swelling are moderate. Reaction ranges from neutral to strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled.

Most areas of this soil are used for cultivated crops, hay, and pasture. Many small areas are homesites. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Where this soil is cultivated, there is an erosion hazard. Terraces, grassed waterways, minimum tillage, winter cover crops, and a suitable crop rotation help prevent excessive soil loss. Proper management of crop residue, green manure crops, and the addition of barnyard manure improve fertility, reduce crusting, help to maintain organic matter content, and increase water infiltration.

The use of the soil for pasture and hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This Menfro soil is also suited to orchards and vineyards (fig. 10).

This soil is suited to trees, and a few small areas remain in native hardwoods. There are only slight limitations for planting or harvesting trees.

This soil is suitable for building sites and septic tank absorption fields if proper design and installation procedures are used. Damage from shrinking and swelling can be reduced by adequately reinforcing footings, basement walls, and floors. Installing drainage tile around footings helps prevent excessive wetness around foundations where surface drainage is poor and gutters fail. Excessive seepage from sewage lagoons can be prevented by sealing the bottom of the lagoon. This soil does not have sufficient strength to support vehicular traffic, but this can be corrected by adding crushed rock or other suitable material to the base. Constructing the subgrade to shed water, as well as providing side ditches and culverts, helps prevent damage from frost action.

This soil is in capability subclass IIIe and woodland ordination 3o.

7D2—Menfro silt loam, 9 to 14 percent slopes, eroded. This strongly sloping, well drained soil is on narrow ridgetops and on upper side slopes. Individual areas are long and narrow or have regular, banded shapes, and they range from 10 to 80 acres.

Typically, the surface layer is dark yellowish brown silt loam about 5 inches thick. The subsoil is brown silty clay loam about 33 inches thick. The underlying material to a depth of 60 inches or more is brown and dark yellowish brown silt loam. In some areas on the lower side slopes, gray mottles are in the lower part of the subsoil. In other areas the natural soil has been disturbed by development.

Permeability of this Menfro soil is moderate, and surface runoff from cultivated areas is rapid. The available water capacity is high. Shrinking and swelling are moderate. Reaction ranges from slightly acid to strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium, and the organic matter content is low. The surface layer is friable and easily tilled. It does have a tendency to crust after hard rains, because the subsoil is mixed into the surface layer.

Most areas of this soil are farmed. This soil is suited to small grains and hay and pasture. If the soil is used for cultivated crops, there is a severe erosion hazard. Minimum tillage, winter cover crops, and grassed waterways help prevent erosion damage. Many slopes are long and smooth enough for terraces and farming on the contour. Gullies should be shaped and seeded to grass. Proper management of crop residue and green

Figure 10.—Vineyards and orchards grow well on Menfro silt loam, 5 to 9 percent slopes.

manure crops help control erosion, maintain and improve organic matter content and tilth, and increase water infiltration.

The use of this soil for pasture or hay is very effective in controlling erosion. Overgrazing should be avoided. Grazing when the soil is too wet causes surface compaction, poor tilth, and excessive runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is suited to trees, and many areas have stands of timber. There are only slight limitations for planting or harvesting trees.

This soil is suitable for building sites and septic tank absorption fields if proper design and installation procedures are used to overcome the moderate limitations of slope and shrinking and swelling. Basement walls, footings, and foundations for dwellings and small buildings should be adequately reinforced to prevent structural damage from shrinking and swelling. Drainage tile installed around footings helps prevent excessive wetness around foundations where surface drainage is poor and gutters fail. If sewage distribution lines are installed across the slope, absorption fields should function adequately.

This soil does not have sufficient strength to support vehicular traffic, but this can be overcome by strengthening the base with crushed rock or other suitable material. Constructing the subgrade to shed water, as well as providing side ditches and culverts helps prevent damage caused by frost action.

This soil is in capability subclass IIIe and woodland ordination 3o.

7E2—Menfro silt loam, 14 to 20 percent slopes, eroded. This moderately steep, well drained soil is on

dissected side slopes. Individual areas are irregular in shape and range from 10 to 60 acres.

Typically, the surface layer is brown silt loam about 4 inches thick. The subsoil extends to a depth of about 42 inches. It is dark yellowish brown silt loam in the upper part and brown silty clay loam in the lower part. The underlying material to a depth of 60 inches or more is brown silt loam. In some areas on the lower side slopes, gray mottles are in the lower part of the subsoil. Also, in some places, the subsoil is redder in the lower part.

Permeability of this Menfro soil is moderate, and surface runoff is rapid. The available water capacity is high. Reaction ranges from slightly acid to medium acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium, and the organic matter content is low. The surface layer is friable and fairly easy to till. It does have a tendency to crust after heavy rains, because some of the subsoil is mixed into the surface layer.

Most areas of this soil are used for woodland. This soil is suited to grasses and legumes for pasture and hay, but slopes are too steep for regular cultivation. The erosion hazard is severe. In areas protected by terraces, however, cultivated crops can be grown in rotation with pasture and hay without serious erosion damage. Minimum tillage and terraces that have steep, grassed backslopes should be used. This soil is highly susceptible to gullying, and careful design and maintenance of waterways is critical. The use of crop residue and barnyard manure improves fertility and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Many areas remain in native hardwoods, dominately white oak of good quality. The erosion hazard, equipment limitation, and seedling mortality are moderate. Roads and skid trails should be constructed on the contour to minimize the steepness and length of slope. Seeding disturbed areas may be necessary after harvesting. In these steep areas, logs need to be yarded uphill to logging roads or skid trails. Using planting stock of larger size than usual may be necessary to achieve better survival.

This soil is suitable for building sites and septic tank absorption fields, but is severely limited by slope. This soil can be made suitable for low-density building sites by extensive site preparation. The cost of such preparation can be restrictive. Dwellings can be designed to conform to the slope, but land grading may be necessary in some areas. Buildings should be properly designed and reinforced to prevent structural damage caused by shrinking and swelling of the soil. Also, rapid runoff needs to be prevented or diverted.

The use of this soil for local roads and streets is limited by low strength and frost action. The base needs to be strengthened with crushed rock or other suitable material. Constructing the subgrade to shed water, as well as providing side ditches and culverts helps to prevent the damage caused by frost action. Some areas need cutting and filling to modify the steep slope.

This soil is in capability subclass IVe and woodland ordination 3r.

7F—Menfro silt loam, 20 to 30 percent slopes. This steep, well drained soil is on dissected side slopes. Individual areas are irregular in shape and range from 10 to 60 acres.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark yellowish brown silt loam, and the lower part is dark yellowish brown silty clay loam.

Included with this soil in mapping are small areas of cherty Goss soils along the upper reaches of drainageways on hillsides. These inclusions make up about 5 percent of this unit.

Permeability of this Menfro soil is moderate, and surface runoff is very rapid. Reaction is slightly acid in the surface layer and ranges from medium acid to strongly acid in the subsoil. The available water capacity is high. Shrinking and swelling are moderate. Natural fertility is medium, and organic matter content is moderately low.

Most areas of this soil are in woodland. This soil is generally not suited to use as cropland and should be tilled only when necessary for reseeding pastures. When grasses and legumes are grown, the timely use of minimum tillage helps prevent severe erosion. Seed should be planted early enough to establish good ground cover before the end of the growing season. Nurse crops can be used to provide cover late in fall and in winter months until grasses and legumes are established. Mowing and harvesting hay crops is difficult because of the steep, uneven slopes.

If this soil is used for pasture, overgrazing should be avoided. Grazing when the soil is too wet causes surface compaction, poor tilth, and excess runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is suited to trees, and most areas have stands of native hardwoods. Steepness of slope is a moderate limitation affecting erosion, use of equipment, and seedling mortality. Roads and skid trails should be constructed on the contour to minimize the steepness and length of slope. Seeding disturbed areas may be necessary after harvesting. In these steep areas, logs can be yarded uphill to logging roads or skid trails. Using

planting stock of a larger size than usual may be necessary to achieve a better rate of plant survival. Existing stands need selective cutting of undesirable trees. New stands need protection from fire and overgrazing. These practices also improve the habitat for woodland wildlife, especially white-tailed deer and wild turkey.

This soil is generally not suited to building sites and septic tank absorption fields because of the steepness of slope. It is a suitable site, however, for low-density building if site preparation is extensive. The cost of such preparation can be restrictive.

This soil is in capability subclass VIe and woodland ordination 3r.

8C—Winfield silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on foot slopes along creek bottoms. Individual areas are irregular in shape and range from 5 to 30 acres.

Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsoil extends to a depth of about 44 inches. The upper part is brown silty clay loam, and the lower part is light brownish gray and yellowish brown silty clay loam. The underlying material to a depth of 60 inches or more is yellowish brown silty clay loam. In some areas the surface layer is silty clay loam. In a few areas, gray mottles are not in the lower part of the subsoil. Also there are some areas with less than 5 percent slopes.

Permeability of this Winfield soil is moderate, and surface runoff from cultivated areas is medium. The available water capacity is high, and a seasonal high water table is at a depth of 2.5 to 4.0 feet during winter and spring. Shrinking and swelling are moderate. Reaction ranges from very strongly acid to neutral. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled.

Most areas of this soil are used for cultivated crops, hay, and pasture. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Where this soil is cultivated, there is an erosion hazard. Terraces, grassed waterways, minimum tillage, winter cover crops, and a suitable crop rotation help prevent excessive soil loss. Proper management of crop residue, green manure crops, and the addition of barnyard manure improve fertility, reduce crusting, and increase water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, and some areas remain in native hardwoods. It is also suitable for orchards and vineyards where it is at a high enough elevation to escape frost damage in spring. There are only slight hazards to planting or harvesting trees.

This soil is suitable for building sites and for sewage lagoons if proper design and installation procedures are used to overcome wetness and shrinking and swelling. Footings, foundations, and basement walls should be adequately reinforced to prevent damage from shrinking and swelling of the soil. Installing tile drains around footings helps prevent excessive wetness. Sewage lagoons will function if the area can be leveled enough for a site and if soil compaction or special treatment seals the bottom of the lagoon.

This soil does not have sufficient strength to support vehicular traffic, but this can be corrected by adding crushed rock or other suitable material to the road base. Constructing side ditches and culverts for proper drainage helps prevent damage caused by frost action.

This soil is in capability subclass IIIe and woodland ordination 3o.

8D—Winfield silt loam, 9 to 14 percent slopes. This strongly sloping, moderately well drained soil is mainly on upper side slopes. Most areas are irregular in shape and range from 10 to 60 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 37 inches thick. The upper part is brown silty clay loam, and the lower part is brown, mottled silt loam. The underlying material to a depth of 60 inches or more is brown, mottled silt loam. In some areas the surface layer is silty clay loam. In a few areas, gray mottles are not in the lower part of the subsoil.

Permeability of this Winfield soil is moderate, and surface runoff from cultivated soil is rapid. The available water capacity is high, and a seasonal high water table is at a depth of 2.5 to 4.0 feet during winter and spring. Shrinking and swelling are moderate. Reaction ranges from neutral to medium acid. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable, but it does have a tendency to crust after heavy rains where the subsoil is mixed into the surface layer.

Most areas of this soil are used for cultivated crops, hay, and pasture. This soil is suited to corn, soybeans, and grasses and legumes for pasture and hay. Where the soil is cultivated, there is a severe erosion hazard. Terraces, grassed waterways, minimum tillage, and suitable crop rotation help prevent excessive soil loss. Terraces with steep grassed backslopes should be used. Gullying is a serious problem, and waterways require careful design and maintenance. The use of crop residue and barnyard manure improves fertility and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive

runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is suited to trees, and some areas remain in native hardwoods, dominantly white oak of good quality. Tree stands need to be improved for timber. There are only slight hazards or limitations for planting or harvesting trees.

This soil is suitable for building sites and for sewage lagoons if proper design and installation procedures are used to overcome moderate limitations of slope, shrinking and swelling, and wetness. Dwellings can be designed to conform to the natural lay of the land. Land shaping may be necessary in some areas. Shrinking and swelling can be reduced by adequately reinforcing footings, foundations, and basement walls. Wetness can be minimized by installing drainage tile around footings and foundations. Sewage lagoons will function if slopes can be modified by grading and if soil compaction or special treatment seals the bottom of the lagoon. This soil does not have strength to support vehicular traffic, but this can be corrected by adding crushed rock or other adequate material to the road base.

This soil is in capability subclass IIIe and woodland ordination 3o.

8E2—Winfield silty clay loam, 14 to 20 percent slopes, eroded. This moderately steep, moderately well drained soil is on dissected side slopes. Most areas are irregular in shape and range from 10 to 60 acres.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil extends to a depth of about 40 inches. It is brown silt loam in the upper part, brown and dark brown silty clay loam in the middle part, and strong brown, mottled silty clay loam in the lower part. The underlying material to a depth of 60 inches or more is dark yellowish brown silty clay loam. In a few areas gray mottles are not in the lower part of the subsoil, and in some areas the surface layer is silty clay loam.

Included with this soil in mapping are small areas of cherty Goss soils, mostly at the upper reaches of drainageways. This inclusion makes up less than 5 percent of the unit.

Permeability of this Winfield soil is moderate, and surface runoff from cultivated areas is rapid. The available water capacity is high, and a seasonal high water table is at a depth of 2.5 to 4.0 feet during winter and spring. Shrinking and swelling are moderate. Reaction ranges from medium acid to very strongly acid in the subsoil and varies in the surface layer according to liming practices. Natural fertility is medium, and the organic matter content is low. The surface layer is friable and easily tilled. There are no restrictions to root development.

Most areas of this soil are used as pasture and woodland. This soil is suited to grasses and legumes for pasture and hay. Slopes are too steep for regular cultivation. In areas protected by terraces, however, occasional cultivated crops can be grown in rotation with pasture and hay crops without serious erosion damage. Terraces that have steep, grassed backslopes and minimum tillage should be used. Because this soil is highly susceptible to gullying, design and maintenance of waterways are critical. The use of barnyard manure and crop residue improves fertility and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, and many areas remain in native hardwoods, dominantly white oak of good quality. Erosion hazard, equipment limitation, and seedling mortality are moderate limitations. Roads and skid trails should be constructed on the contour to minimize the steepness and length of slope. Seeding disturbed areas may be necessary after harvesting. In these steep areas, logs need to be yarded uphill to logging roads or skid trails. Using planting stock of larger size than usual may be necessary to achieve a better rate of plant survival.

This soil is generally unsuitable for building sites and septic tank absorption fields because of the steepness of the slope. This soil can be made suitable for building sites by extensive site preparation, but the high cost of such preparation can be restrictive.

This soil is in capability subclass IVe and woodland ordination 3r.

9E—Holstein loam, 14 to 35 percent slopes. This moderately steep to very steep, well drained soil is on foot slopes, generally downslope from sandstone escarpments. Individual areas are long and narrow and range from 10 to 60 acres.

Typically, the surface layer is very dark grayish brown loam about 6 inches thick. The next layer is brown and strong brown loam about 8 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is yellowish red, very firm clay loam; the middle part is strong brown, very firm clay loam; and the lower part is strong brown, friable sandy clay loam. In some areas sandstone bedrock is at a depth of 40 to 60 inches.

Permeability of this Holstein soil is moderate. Surface runoff is rapid, and the hazard of erosion of bare soil is severe. The available water capacity is high. Shrinking and swelling are moderate. Reaction ranges from medium acid to very strongly acid in the subsoil, and it ranges widely in the surface layer due to local liming practices. Natural fertility is low, and the organic matter

content is moderately low. The surface layer is friable and is easily tilled.

Most areas of this soil are in woodland. This soil is suited to trees, and most areas have stands of native hardwoods. Steepness of slope is a moderate limitation affecting erosion, use of equipment, and seedling mortality. Roads and skid trails should be constructed on the contour to minimize the steepness and length of slope. Seeding disturbed areas may be necessary after harvesting. In these steep areas logs can be yarded uphill to logging roads or skid trails. Using planting stock of a larger size than usual may be necessary to achieve a better rate of plant survival. Stands also need protection from fire and overgrazing. These practices also improve the habitat for woodland wildlife, especially white-tailed deer, wild turkeys, and squirrels.

This soil is too steep for use as cropland and should be tilled only when the pasture needs seeding. The timely use of minimum tillage is necessary to control erosion. Seed should be planted early enough to establish good ground cover before the end of the growing season. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods keep the pasture and soil in good condition.

This Holstein soil is generally unsuitable for building sites and septic tank absorption fields because of the steepness of the slope. This severe limitation can be difficult to overcome because the cost of preparing the site for construction and working equipment can be restrictive.

This soil is in capability subclass VIe and woodland ordination 3r.

10F—Gasconade-Rock outcrop complex, 15 to 50 percent slopes. This moderately steep to very steep, shallow, somewhat excessively drained soil is on side slopes. Individual areas are irregular in shape and range from 5 to 100 acres. About 70 percent is Gasconade soil, and about 30 percent is Rock outcrop.

Typically, the surface layer is very dark gray silty clay loam about 4 inches thick. The subsoil is dark brown, firm cherty silty clay loam about 11 inches thick. Limestone bedrock is at a depth of about 15 inches. In a few places, it is more than 20 inches to bedrock.

Permeability of this Gasconade soil is moderately slow, and surface runoff is very rapid. The available water capacity is low. Shrinking and swelling are moderate. Reaction ranges from mildly alkaline to slightly acid. The organic matter content is moderate, and natural fertility is low. Rooting depth is restricted at a depth of 20 inches or less by bedrock.

Nearly all areas of this Gasconade soil are used for woodland. They are suited to native redcedar for fenceposts or furniture manufacturing and to post oak for firewood. Steep slopes and stones are severe limitations to the use of equipment, and slope and shallow depth to bedrock cause moderate seedling mortality and windthrow. Roads and skid trails should be located on the contour. Most timber is harvested as posts or small logs to offset problems with yarding logs and windthrow damage. In most places, it is necessary to plant seedlings by hand using a stock of a larger size than usual to achieve a better rate of plant survival.

This soil is generally unsuitable for building sites and septic tank absorption fields because of the steep slope and shallow depth to bedrock.

This soil is in capability subclass VIIs and woodland ordination 5d.

11—Dockery silt loam. This nearly level, somewhat poorly drained soil is on alluvial flood plains along creek and stream branches. Unprotected areas occasionally flood for brief durations. Individual areas are generally long and variable in width and range from 10 to several hundred acres.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The underlying material extends to a depth of 60 inches or more. The upper part is brown silt loam with dark grayish brown mottles, and the lower part is grayish brown silt loam with brown mottles. In some areas the surface layer is thicker.

Included with this soil in mapping are small areas of well drained Haymond soils and moderately well drained Kennebec soils. The Haymond soils are on low, narrow natural levees along the stream channel. The Kennebec soils are in slightly higher areas bordering uplands. Also included are some areas of a soil that has been disturbed by urban and suburban development. These areas have been covered by soil material from nearby uplands so that the original surface is buried by several feet of fill. Total inclusions make up about 5 percent of the unit.

Permeability of this Dockery soil is moderate, and surface runoff is slow. The available water capacity is very high. Reaction ranges from neutral to slightly acid. Natural fertility is high, and the organic matter content is moderate. The surface layer is very friable and easily tilled throughout a wide range in moisture content. Root development is restricted somewhat in the spring because the seasonally high water table is at a depth of 1 foot to 3 feet.

Nearly all areas of this soil are used for cultivated crops, hay, or pasture. It is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Wet spots in fields can be corrected by land grading. Returning crop residue to the soil helps maintain fertility and tilth. If this soil is used for pasture, overgrazing and grazing when the soil is too wet should be avoided. Proper stocking, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, although few areas remain in woodland. Plant competition is a moderate limitation for planting trees. This can be reduced by site

preparation that includes prescribed burning or spraying or cutting.

This soil is generally unsuitable for building sites and septic tank absorption fields because of occasional flooding.

This soil is in capability subclass IIw and woodland ordination 3o.

12—Kennebec silt loam. This nearly level, moderately well drained soil is on flood plains of creeks and stream branches. Areas of this soil are subject to occasional flooding of brief duration. Individual areas are irregular in shape and range from 3 to 25 acres.

Typically, the surface layer is very dark gray silt loam about 11 inches thick. The subsurface layer, about 26 inches thick, is very dark gray silt loam in the upper part and very dark gray silty clay loam in the lower part. The underlying material to a depth of 60 inches or more is dark gray and dark grayish brown silty clay loam. In some areas, the surface layer and subsurface layer are thinner. Also, in some areas the underlying material is browner.

Permeability of this Kennebec soil is moderate, and surface runoff is slow. The available water capacity is very high. There is a seasonal water table at a depth of 3 to 5 feet during winter months. Shrinking and swelling are moderate. Reaction is medium acid or slightly acid. Natural fertility and the organic matter content are high. The surface layer is very friable and easily tilled.

Nearly all areas of this soil are used for cultivated crops. This soil is highly productive and is well suited to all adapted crops. There are no major problems associated with farming this soil. Minor management problems include flooding for brief periods and streambank cutting.

This soil is suited to trees. However, because of the high value of this soil for cultivated crops, only a very few small areas remain in timber. There are no limitations for planting or harvesting trees.

This soil is generally unsuitable for building sites and septic tank absorption fields because of occasional flooding.

This soil is in capability subclass IIw and woodland ordination 2o.

13—Auxvasse silt loam. This nearly level, poorly drained soil is on stream terraces. It is subject to rare flooding. In some areas along the sides of the terrace, slopes are short and steep. Individual areas are irregular in shape and range from 5 to 35 acres.

Typically, the surface layer is brown silt loam about 8 inches thick. The next layer is dominantly pale brown silt loam. The subsoil extends to a depth of about 40 inches. It is mottled, firm silty clay and silty clay loam. The underlying material to a depth of 60 inches or more is mottled grayish brown and yellowish brown silty clay loam.

Permeability of this Auxvasse soil is very slow, and surface runoff is slow. The available water capacity is moderate. A seasonal high water table is at a depth of 1 foot to 2 feet during winter and spring. The shrink-swell potential is high. Reaction is strongly acid to very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility and the organic matter content are low. The surface layer is friable and easily tilled. Root development is somewhat restricted below 13 inches by poor aeration.

Most areas of this soil are used for cultivated crops, hay, and pasture. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Although the available water capacity is moderate, insufficient soil moisture is often a limitation for row crops during the summer. High plant populations of corn and grain sorghum should be avoided. This soil is quite acid and limited in fertility and requires the addition of lime and fertilizer to grow crops adequately. The return of crop residue to the soil or the addition of manure improves fertility and increases water infiltration.

This soil is suited to pasture and hay crops. Deep-rooted legumes, such as alfalfa, are generally not suited to this soil because it has poor internal drainage. Pasture rotation, proper stocking, and deferred grazing during wet periods help to keep the pasture and soil in good condition.

This soil is generally unsuitable for building sites and septic tank absorption fields because of rare flooding.

This soil is in capability subclass IIIw and woodland ordination 4w.

22F—Gatewood-Gasconade-Crider complex, 15 to 50 percent slopes. This map unit consists of moderately steep to very steep, well drained and somewhat excessively drained soils on side slopes. The slopes are long, and the drainageways are deeply incised into the landscape. This complex is about 60 percent Gatewood soils, 20 percent Gasconade soils, 15 percent Crider soils, and 5 percent other soils. The Gatewood soils are on the upper side slopes. The Gasconade soils are in short, steep areas lower on the landscape than the Gatewood soils. The Crider soils are on foot slopes lower than the Gasconade soils and are adjacent to the bottom lands. These soils are so intermingled that they could not be shown separately at the scale selected for mapping. Individual areas of this unit range from 15 to 100 acres or more.

Typically, the Gatewood soil has a surface layer of very dark grayish brown silt loam about 2 inches thick. The subsoil is about 22 inches thick. The upper part is brown, firm silty clay, and the lower part is strong brown, firm clay. Hard limestone bedrock is at a depth of 24 inches. In some places, the surface layer is cherty. Also in some places, the subsoil is redder.

Typically, the Gasconade soil has a surface layer of very dark gray silty clay loam about 4 inches thick. The subsoil is dark brown, firm cherty silty clay loam. Limestone bedrock is at a depth of 15 inches.

Typically, the Crider soil has a surface layer of dark brown silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown and strong brown, firm silty clay loam, and the lower part is reddish brown, firm silty clay loam.

Included with this complex in mapping are small areas of cherty Goss soils, mainly on upper side slopes and heads of drainageways. This inclusion makes up less than 5 percent of the unit.

Permeability is slow in the Gatewood soil, moderately slow in the Gasconade soil, and moderate in the Crider soil. Surface runoff in this complex is very rapid. The available water capacity is very low in the Gatewood and Gasconade soils and high in the Crider soil. Reaction ranges from neutral to mildly alkaline in the Gatewood and Gasconade soils and from medium acid to strongly acid in the Crider soil. Natural fertility is low in this unit. Most areas of this complex have some chert or limestone fragments on the surface.

These soils are suited to trees, and nearly all areas are in woodland. The hazard of erosion, limitations to the use of equipment, seedling mortality, hazard of windthrow, and plant competition are moderate to severe. These limitations indicate the need for careful design and construction of roads and skid trails. In these steep areas logs can be yarded uphill to logging roads and skid trails. Proper management of ground cover and seeding disturbed areas help to control erosion. The rate of seedling survival can be increased by using planting stock of a larger size than usual in areas where reinforcement planting is needed. The windthrow hazard can be reduced by lighter, less intensive, and more frequent thinnings of stands too dense for maximum growth.

Many areas of Gatewood and Crider soils can be improved as habitat for wildlife, especially deer, grouse, and wild turkeys, by making openings in the hardwood forest canopy. Selective harvest of mature timber is effective.

The Crider soil can be cleared and used for pasture if erosion is carefully controlled. Minimum tillage is necessary to prevent severe erosion of pastures seeded with grasses and legumes. Overgrazing should be avoided. Most existing pastures need renovation and brush control.

These soils are generally unsuitable for building sites and septic tank absorption fields because they are severely limited by steep slopes and shallowness to bedrock. These soils are suitable for low-density building if site preparation is extensive, but the cost of such preparation can be restrictive.

This complex is in capability subclass VIIs, and the woodland ordination is 5c for Gatewood soils, 5d for Gasconade soils, and 3r for Crider soils.

24D2—Keswick silt loam, 9 to 14 percent slopes, eroded. This strongly sloping, moderately well drained soil is on upper side slopes. Individual areas are irregular in shape and range from 20 to 100 acres.

Typically, the surface layer is brown silt loam about 3 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is dark yellowish brown silty clay loam; the middle part is strong brown, mottled, firm clay loam; and the lower part is strong brown, mottled, firm clay. In some areas the surface layer is darker, and the subsoil does not have gray mottles in the upper part.

Included with this soil in mapping are some small areas of moderately well drained Crider soils. Also included are cherty Goss soils on lower side slopes. Total inclusions make up about 1 to 5 percent of the unit.

Permeability of this Keswick soil is slow, and surface runoff from cultivated areas is rapid. The available water capacity is moderate. A seasonal water table is at a depth of 1 foot to 3 feet during winter and spring. The shrink-swell potential is high. Reaction ranges from medium acid to strongly acid in the upper part of the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is low, and the organic matter content is moderately low. The surface layer is friable and fairly easily tilled. It does, however, have a tendency to crust after hard rains, especially in areas where the plow layer contains subsoil material. Root development is restricted below a depth of about 25 inches by the clayey glacial till.

Most areas of this soil are in pasture, hay, or woodland. This soil is suited to cultivated crops if erosion is carefully controlled. Minimum tillage, winter cover crops, and grassed waterways help to prevent serious erosion. Slopes that are long and smooth enough can be terraced and farmed on the contour. Proper management of crop residue and green manure crops help to control erosion, maintain and improve organic matter content and tilth, and increase water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, poor tilth, and excessive runoff. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is suited to trees, and many areas remain in native hardwoods, dominately white oak of good quality. There are only slight limitations for planting trees. The windthrow hazard is moderate, but it can be avoided by frequent, light thinning of the stand.

This Keswick soil is suited to building sites and sewage lagoons, but wetness and the high shrink-swell

potential are severe limitations. Basements, foundations, and footings should be properly designed and reinforced to prevent damage from shrinking and swelling. Drainage tile should be installed around footings to help prevent damage caused by excessive wetness. Sewage lagoons will function adequately if the area can be leveled enough for a site. If this is not feasible, the sewage should be piped to adjacent areas where the soils are more suitable. This soil does not have sufficient strength to support vehicular traffic, but this can be overcome by strengthening the base material with crushed rock or other suitable material. Side ditches and culverts can provide proper drainage to help prevent damage from frost action and shrinking and swelling.

This soil is in capability subclass IVe and woodland ordination 4c.

27C—Armster silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on upper side slopes on uplands. Individual areas are long and narrow and range from 10 to 50 acres.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is about 7 inches of dark grayish brown silt loam. The subsoil extends to a depth of about 48 inches. The upper part is brown, mottled silt loam; the middle part is brown, mottled, firm clay; and the lower part is yellowish brown, mottled, firm clay. The underlying material to a depth of 60 inches or more is grayish brown and dark yellowish brown clay. In eroded areas, the surface layer is silty clay loam. Also, in some areas the surface layer is lighter colored, and the subsoil has a few gray mottles in the lower part.

Permeability of this Armster soil is moderately slow, and surface runoff from cultivated areas is medium. The available water capacity is moderate. A seasonal high water table is at a depth of 2.5 to 4.0 feet during winter and spring. The shrink-swell potential is high. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for cultivated crops, hay, and pasture. This soil is suited to corn, soybeans, and grasses and legumes for hay and pasture. Where this soil is cultivated, there is an erosion hazard. Terraces, grassed waterways, minimum tillage, and suitable crop rotations help prevent excessive soil loss. The use of crop residue and barnyard manure improves fertility and increases water infiltration.

The use of this soil for pasture and hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is suited to trees. There are only slight limitations to planting or harvesting trees.

This soil is suited to building sites and sewage lagoons. The high shrink-swell potential is a severe limitation for dwellings. Foundations and footings should be adequately reinforced to prevent structural damage. Drainage tile should be installed around footings to prevent damage from excessive wetness. Sewage lagoons will function adequately if the area can be leveled. Less sloping areas can be selected or sewage can be piped to adjacent areas where the soils are more suitable for lagoons. The bottom of the lagoon may need sealing to prevent seepage. This soil does not have sufficient strength to support vehicular traffic, but this can be overcome by strengthening the base material with crushed rock or other suitable material. Side ditches and culverts can provide proper drainage to help prevent damage from frost action and shrinking and swelling.

This soil is in capability subclass IIIe and woodland ordination 4o.

31C—Hatton silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is on the crests of narrow, rounded ridgetops. Individual areas are long and narrow and range from 10 to several hundred acres.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 38 inches. The upper part is yellowish brown silt loam and firm silty clay loam; the middle part is dark brown, firm silty clay loam; and the lower part is strong brown, firm silty clay loam. The underlying material to a depth of 67 inches or more is strong brown and yellowish red, very firm clay loam.

Included with this soil in mapping are small areas of poorly drained Marion soils on nearly level ridgetops and some areas of strongly sloping Keswick soils on narrow ridge points. Total inclusions make up about 5 percent of the unit.

Permeability of this Hatton soil is very slow, and surface runoff is medium. The available water capacity is moderate. A seasonal high water table is at a depth of 1.5 to 3.0 feet during winter and spring. Shrinking and swelling is moderate. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled throughout a wide range in moisture content. Root development is restricted somewhat by the compactness of the lower subsoil.

Most areas of this soil are used for cultivated crops, pasture, and hay, but some areas remain in woodland. This soil is suited to corn, soybeans, small grains, and

grasses and legumes for hay and pasture. Where the soil is cultivated, there is an erosion hazard. In many areas short, complex slopes make terracing difficult. Minimum tillage, winter cover crops, and crop rotations that include hay and pasture crops are effective in controlling erosion. Although the available water capacity is moderate, insufficient soil moisture is often a limitation for row crops during the summer. High plant populations of corn and grain sorghum should be avoided. In its natural state, this soil is quite acid and limited in fertility and requires the addition of lime and fertilizer. The return of crop residue to the soil and the regular addition of barnyard manure improve fertility and increase water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, and many areas remain in native hardwoods, dominately of good quality white oak. There are no major limitations for planting or harvesting trees.

This soil is suited to building sites and sewage lagoons if proper design and installation procedures are used to overcome wetness and the moderate shrink-swell potential. Damage from shrinking and swelling can be reduced by adequately reinforcing footings, foundations, and basement walls and installing drainage tile around footings to prevent damage caused by excessive wetness. Waste disposal can be handled by sewage lagoons, if the area can be leveled. This soil does not have sufficient strength to support vehicular traffic, but this can be overcome by strengthening the base material with crushed rock or other suitable material. Side ditches and culverts can provide proper drainage to help prevent damage from frost action.

This soil is in capability subclass IIIe and woodland ordination 4c.

34E—Lindley loam, 14 to 20 percent slopes. This moderately steep, well drained soil is on dissected, uneven side slopes. Individual areas are irregular in shape and range from 10 to 100 acres.

Typically, the surface layer is very dark grayish brown loam about 3 inches thick. The subsurface layer is light yellowish brown loam about 7 inches thick. The subsoil extends to a depth of about 37 inches. The upper part is yellowish brown, firm clay, and the lower part is strong brown, firm clay. The underlying material to a depth of 60 inches or more is mottled, strong brown and grayish brown, firm clay loam.

Included with this soil in mapping are a few areas of cherty Goss soils along deep drainageways.

Permeability of this Lindley soil is moderately slow, and the available water capacity is moderate. Surface runoff is rapid. Shrinking and swelling are moderate. Reaction ranges from medium acid to extremely acid in the subsoil and varies in the surface layer due to local liming practices. Natural fertility is low, and the organic matter content is moderately low. The surface layer is friable.

Most areas of this soil are in woodland. This soil is suited to trees, and most areas have stands of native hardwoods, mainly good quality white oaks. Steep slopes are moderate limitations that increase the hazard of erosion and restrict the use of equipment for planting and harvesting trees. These limitations can be overcome to some extent by the timely use of equipment when the topsoil is dry and firm or in winter when the ground is frozen. Roads and skid trails should be constructed on the contour. In these steep areas, logs can be yarded uphill. Proper management of ground cover helps to prevent erosion. It may be necessary to seed disturbed areas after harvesting is completed. Most existing tree stands need selective cutting and thinning of undesirable trees. New timber stands need protection from fire and grazing. These practices also improve the habitat for woodland wildlife, especially white-tailed deer and wild turkey.

This soil is too steep for use as cropland and should be tilled only when the pasture needs reseeding. The timely use of minimum tillage is necessary to control erosion. Seed should be planted early enough to establish good ground cover before the end of the growing season. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during prolonged wet periods help keep the pasture and soil in good condition.

This soil is generally unsuitable for building sites and septic tank absorption fields because of the steep slopes. The cost of designing and preparing the site for construction can be restrictive.

This soil is in capability subclass VIe and woodland ordination 4c.

35B—Mexico silt loam, 1 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad upland divides. Individual areas are irregular in shape and range from 50 to 200 acres.

Typically, the surface layer is very dark grayish brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 6 inches thick. The subsoil is about 18 inches thick. The upper part is dark grayish brown, mottled, firm silty clay loam, and the lower part is grayish brown, mottled, firm silty clay. The underlying material to a depth of 70 inches or more is mottled, dark yellowish brown and grayish brown, firm silty clay loam. In some places, the original surface layer has been eroded away, and the present surface layer is silty clay loam or silty clay subsoil material. In other places the

very dark grayish brown surface layer is more than 10 inches thick.

Included with this soil in mapping are some small areas of moderately well drained Hatton soils on narrow ridge points. Total inclusions make up 1 to 5 percent of the unit.

Permeabiltiy of this Mexico soil is very slow, and surface runoff from cultivated areas is medium. The available water capacity is high. A seasonal high water table is at a depth of 1 foot to 2 feet during winter and spring. The shrink-swell potential is high. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility and the organic matter content are moderate. The surface layer is friable and easily tilled throughout a fairly wide range in moisture content. It does, however, have a tendency to crust or puddle after hard rains, especially in areas where the plow layer contains subsoil material. Root development is restricted somewhat by the silty clay subsoil.

Most areas of this soil are used for cultivated crops, hay, and pasture. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is an erosion hazard. Minimum tillage, winter cover crops, and grassed waterways help prevent excessive soil loss. Most areas have slopes that are long and smooth enough to be terraced and farmed on the contour. Returning crop residue to the soil or the regular addition of other organic material improves fertility, reduces crusting, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. A few small areas are in native hardwoods. Seedling mortality and windthrow are moderate concerns in planting and harvesting trees. Using special planting stock of a larger size than usual may be necessary to achieve a better rate of plant survival. Lighter, less intensive, and more frequent thinning of stands may be necessary to reduce windthrow.

This soil is suited to building sites, but the high shrink-swell potential and wetness are severe limitations. Damage from shrinking and swelling can be reduced by adequately reinforcing footings, foundations, and basement walls, and excessive wetness can be prevented by installing drainage tile around footings. Sewage lagoons will function adequately if the area can be leveled. This soil does not have sufficient strength to support vehicular traffic, but this can be corrected by strengthening the base with crushed rock or other suitable material. Side ditches and culverts can provide proper drainage to help prevent damage from shrinking and swelling and frost action.

This soil is in capability subclass IIe and woodland ordination 4c.

37—Marion silt loam. This nearly level, somewhat poorly drained soil is on narrow ridgetops. Individual areas are irregular in shape and range from 5 to 20 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsurface layer is light brownish gray silt loam about 6 inches thick. The subsoil, which extends to a depth of about 44 inches, is brown, mottled, firm silty clay in the upper part, and grayish brown, mottled, firm silty clay loam in the lower part. The underlying material to a depth of 60 inches or more is grayish brown, mottled, friable silty clay loam.

Included with this soil in mapping are some small areas of moderately well drained Hatton soils.

Permeability of this Marion soil is very slow, and surface runoff is slow. The available water capacity is moderate. A perched water table is at a depth of 1 foot to 2 feet during winter and spring. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is low, and the organic matter content is moderately low. The surface layer is friable and easily tilled. Root development is restricted somewhat by the wet, heavy-textured subsoil.

Most areas of this soil are used for cultivated crops, hay, or pasture. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Deep-rooted legumes, such as alfalfa, do not grow well on this soil because of poor internal drainage. Although the available water capacity is moderate, insufficient soil moisture is often a limitation for row crops during the summer. High plant populations of corn and grain sorghum should be avoided. In its natural state, this soil is quite acid and low in fertility and requires the addition of lime and fertilizer. The return of crop residue to the soil or the addition of other organic matter improves fertility and increases water infiltration.

This soil is suited to pasture and hay crops. Overgrazing or grazing during wet periods causes surface compaction and poor water infiltration. Pasture rotation, proper stocking, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is suited to trees, but the use of equipment is severely limited and plant competition, seedling mortality, and windthrow are moderate. Tree seeds, cuttings, and seedlings survive and grow well if competing vegetation is controlled or removed. This can be accomplished by site preparation or by prescribed burning or spraying or cutting. Wetness can be overcome by scheduling equipment to be used when the topsoil is dry and firm or in winter when the ground is frozen. Ridging the soil and

planting on ridges increase seedling survival. Lighter, less intensive, more frequent thinning of stands may be necessary to reduce windthrow.

This soil is suited to building sites and sewage lagoons but is severely limited for dwellings by wetness and high shrink-swell potential. Areas of this soil that are used for building sites should be adequately drained. Foundations and footings should be adequately reinforced to prevent damage from shrinking and swelling. Drainage tile should be installed around footings to help prevent damage from excessive wetness. Sewage lagoons can function adequately. This soil does not have sufficient strength to support vehicular traffic, but this can be overcome by strengthening the base with crushed rock or other suitable material. Also, proper drainage with well-compacted, raised roadbeds, as well as side ditches and culverts, help prevent damage from shrinking and swelling and frost action.

This soil is in capability subclass IIIw and woodland ordination 5w.

40—Westerville silt loam. This nearly level, somewhat poorly drained soil is on low stream terraces. It is subject to rare flooding for very brief periods. Individual areas are irregular in shape and range from 5 to 20 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The next layer is brown silt loam about 6 inches thick. A buried subsurface layer is dark grayish brown and grayish brown silt loam about 24 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray silt loam and loam.

Permeability of this Westerville soil is moderate, and surface runoff is slow. The available water capacity is very high. A seasonal high water table is at a depth of 1 foot to 3 feet during late winter and early spring. Reaction ranges from slightly acid to strongly acid throughout the profile except where limed. The surface layer is very friable and easily tilled throughout a wide range in moisture content. Natural fertility is high, and the organic matter content is moderately low.

Most areas of this soil are used for cultivated crops, hay, and pasture. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Wetness can be overcome to some extent by surface drainage and by building diversions to prevent water from higher elevations from running down onto the soil. The return of crop residue to the soil helps to maintain fertility and tilth.

This soil is suited to pasture or hay. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is generally unsuitable for building sites and septic tank absorption fields because of rare flooding.

This soil is in capability subclass IIw and woodland ordination 2o.

41—Freeburg silt loam. This nearly level, somewhat poorly drained soil is on high stream terraces. Low areas are subject to rare flooding. In most areas slopes are short and steep along the escarpment of the terrace. Individual areas are irregular in shape and range from 5 to 25 acres.

Typically, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 50 inches thick. It is brown silty clay loam.

Permeability of this Freeburg soil is moderately slow, and surface runoff is slow. The available water capacity is high. A seasonal high water table is at a depth of 1.5 to 3.0 feet during winter and spring. Shrinking and swelling are moderate. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is very friable and easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops, hay, and pasture. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. The return of crop residue to the soil helps maintain fertility and tilth. If this soil is used as pasture, overgrazing and grazing when the soil is too wet should be avoided. Proper stocking, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, although few areas remain in woodland. There are only slight limitations for planting or harvesting trees.

This soil is generally unsuitable for building sites and septic tank absorption fields because flooding is rare.

This soil is in capability subclass IIw and woodland ordination 3o.

43—Cedargap silt loam. This nearly level, somewhat excessively drained soil is on narrow bottom land along small streams. Most areas are subject to occasional flooding. Individual areas are long and narrow and range from 3 to 20 acres.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsurface layer is about 30 inches of dark brown very cherty loam. The underlying material to a depth of 60 inches or more is brown very cherty loam. In some places, the surface layer is cherty loam or cherty silt loam.

Permeability of this Cedargap soil is moderately rapid, and surface runoff is slow. The available water capacity is low. Reaction is neutral. Natural fertility is low, and the organic matter content is moderate. The surface layer is friable and easily tilled except where it contains chert within plow depth.

Most areas of this soil are cleared and used for pasture. This soil is suited to cultivated crops where soil areas are large enough for equipment use. Because of the low available water capacity, corn and soybeans are less suited to this soil than small grains.

The soil is suited to grasses and legumes for pasture and hay. The main concerns in pasture management are proper stocking, pasture rotation, and restricted use during wet periods.

This soil is suited to trees. Some areas that are too small or narrow for cultivation remain in native hardwoods. Plant competition and seedling mortality are moderate. Seedlings survive and grow well in most years if competing vegetation is controlled or removed. This can be accomplished by site preparation or by prescribed burning or spraying or cutting. Using special planting stock of a larger size than usual may be necessary to achieve a better rate of plant survival.

This soil is generally unsuitable for building sites and septic tank absorption fields because of occasional flooding.

This soil is in capability subclass IIIs and woodland ordination 3f.

44—Sensabaugh silt loam. This nearly level, well drained soil is on flood plains along creeks and stream branches. This unit is subject to occasional flooding of very brief duration. Individual areas are generally long and narrow and range from 5 to 50 acres.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsoil is brown silt loam about 25 inches thick. The underlying material to a depth of 60 inches or more is dark reddish brown very cherty loam in the upper part, and brown very cherty sandy clay loam in the lower part. In some places, the surface layer has up to 15 percent coarse fragments.

Included with this soil in mapping are small areas of Cedargap and Haymond soils. The cherty Cedargap soils generally border the main stream channel, and the noncherty Haymond soils border the surrounding uplands. These inclusions make up about 5 percent of the unit.

Permeability of this Sensabaugh soil is moderately rapid, and surface runoff is slow. Reaction ranges from neutral to medium acid. The available water capacity is moderate. A seasonal high water table is at at depth of 4 to 6 feet during winter and spring. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easy to till throughout a wide range in moisture content (fig. 11).

Most areas of this soil are used for cultivated crops, hay, and pasture. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. When this soil is used for cultivated crops, supplemental irrigation is needed in most years to obtain optimum yields. Returning crop residue to the soil or the regular addition of other organic material improves fertility and increases the water holding capacity. Proper stocking and deferment of grazing during wet periods help to keep the soil and pasture in good condition.

Figure 11.—A profile of Sensabaugh silt loam. Sensabaugh soils are on stream bottoms bordering steep, rocky upland areas. They are typically underlain by gravel deposits, which are used locally for road materials.

This soil is suited to trees, although only a few small areas remain in woodland. Plant competition is a severe limitation that can be overcome through site preparation or by prescribed burning or spraying or cutting.

This soil is generally unsuitable for building sites and septic tank absorption fields because of occasional flooding.

This soil is in capability class I and woodland ordination 2o.

48A—Weller silt loam, 0 to 2 percent slopes. This nearly level, moderately well drained soil is on high terraces. Individual areas are irregular in shape and range from 25 to more than 100 acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is grayish brown silty clay loam about 4 inches thick. The subsoil extends to a depth of about 48 inches. The upper part is brown, mottled silty clay loam; the middle part is grayish brown and yellowish brown silty clay; and the lower part is grayish brown silty clay loam. The underlying material to a depth of 60 inches or more is grayish brown, mottled silty clay loam. In some places, the surface layer is silty clay loam.

Included with this soil in mapping are small areas of poorly drained Edinburg soils in shallow depressions. Also included are some small sandy mounds. Total inclusions make up 2 to 5 percent of the unit.

Permeability and surface runoff of this Weller soil are slow. The available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet during winter and spring months. The shrink-swell potential of the subsoil is high. Reaction is strongly acid to slightly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable.

Nearly all areas of this soil are used for cultivated crops, hay, and pasture. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Crops on these soils show a good response to irrigation. Spring tillage is often delayed because of wetness.

Overgrazing or grazing during wet periods causes surface compaction and poor tilth. Proper stocking, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, although very few small areas remain in woodland. Seedling mortality and windthrow hazard are severe. Using special planting stock of a larger size than usual may be necessary to achieve a better rate of plant survival. Lighter, less intensive, more frequent thinning of stands may be necessary to reduce windthrow damage.

This soil is suited to building sites and sewage lagoons, but wetness and high shrink-swell potential are severe limitations for dwellings. Damage from shrinking and swelling can be minimized by adequately reinforcing footings, foundations, and basement walls. Wetness can be reduced by installing drainage tile around footings and foundations. Waste disposal can be adequately handled with sewage lagoons. This soil does not have sufficient strength to support vehicular traffic, but this can be corrected by strengthening the base material with crushed rock or other suitable material. Constructing roads on raised, well-compacted fill material and installing adequate side ditches and culverts helps prevent damage from shrinking and swelling and frost action.

This soil is in capability subclass IIw and woodland ordination 4c.

48B—Weller silt loam, 2 to 5 percent slopes. This gently sloping, moderately well drained soil is on the crests of upland divides. Individual areas have irregular, branched shapes and range from 10 to 100 acres.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The subsoil extends to a depth of 63 inches or more. The upper part is dark yellowish brown, mottled silty clay loam and silty clay; the middle part is mottled, brown, yellowish brown, light brownish gray, and gray silty clay loam; and the lower part is brown, mottled silt loam.

Included with this soil in mapping are small areas of Winfield soils around the outer edge of some ridges. They have more clay in the subsoil than the Weller soil and make up less than 5 percent of the unit.

Permeability of this Weller soil is slow, and surface runoff is medium. The available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet during winter and spring. The shrink-swell potential of the subsoil is high. Reaction ranges from strongly acid to medium acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled.

Most areas of this soil are used for cultivated crops, pasture, and hay. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is an erosion hazard. Minimum tillage, winter cover crops, and grassed waterways help prevent excessive soil loss. The return of crop residue to the soil or the regular addition of other organic matter improves fertility, reduces crusting, and increases water infiltration.

The use of the soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling mortality and windthrow hazard are severe. Using a special planting stock of a larger size than usual may be necessary to achieve a better rate of plant survival. Lighter, less intensive, more frequent thinning of stands may be necessary to reduce windthrow damage.

This soil is suitable for building sites and sewage lagoons if proper design and installation procedures are used to overcome the severe limitations of wetness and high shrink-swell potential. Damage from shrinking and swelling can be minimized by adequately reinforcing footings, foundations, and basement walls. Installing drainage tile around footings helps prevent damage from excessive wetness. Sewage lagoons are suitable for waste disposal if the site can be leveled. This soil does not have sufficient strength to support vehicular traffic, but this can be corrected by strengthening the base

material with crushed rock or other suitable material. Side ditches and culverts can provide proper drainage that helps prevent damage from shrinking and swelling and frost action.

This soil is in capability subclass IIIe and woodland ordination 4c.

48C—Weller silt loam, 5 to 9 percent slopes. This moderately sloping, moderately well drained soil is mainly on upper side slopes and ridgetops. Individual areas have irregular, branched shapes and range from 5 to 150 acres.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is silty clay loam about 30 inches thick. The upper part is mottled brown, dark yellowish brown, and dark grayish brown; the middle part is dark brown; and the lower part is pale brown. The underlying material is yellowish brown silt loam about 24 inches thick.

Permeability of this Weller soil is slow, and surface runoff is medium. The available water capacity is high. A seasonal high water table is at a depth of 2 to 4 feet during winter and spring. The shrink-swell potential of the subsoil is high. Reaction ranges from strongly acid to medium acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled.

Most areas of this soil are used for cultivated crops, hay, and pasture. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If this soil is used for cultivated crops, there is an erosion hazard. Minimum tillage, winter cover crops, and grassed waterways help to control erosion. A few areas have slopes that are long and smooth enough to be terraced and farmed on the contour. Returning crop residue to the soil or the regular addition of other organic material improves fertility, reduces crusting, and increases water infiltration.

The use of this soil for pasture or hay is also effective in controlling erosion. Overgrazing or grazing when the soil is too wet, however, causes surface compaction, excessive runoff, and poor tilth. Proper stocking, pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition (fig. 12).

This soil is suited to trees. Seedling mortality and windthrow hazard are severe. Using a special planting stock of a larger size than usual may be necessary to achieve better stands. Lighter, less intensive, more frequent thinning of stands may be necessary to reduce windthrow damage.

This soil is suited to building sites, but the high shrink-swell potential and wetness are severe limitations. Damage from shrinking and swelling can be reduced by adequately reinforcing footings, foundations, and basement walls. Wetness can be reduced by installing drainage tile around footings and foundations. Waste disposal can be adequately handled by sewage lagoons, if the area can be leveled. This soil does not have sufficient strength to support vehicular traffic, but this can be corrected by strengthening the base material with crushed rock or other suitable material. Side ditches and culverts can provide proper drainage that helps prevent damage from shrinking and swelling and frost action.

This soil is in capability subclass IIIe and woodland ordination 4c.

54C—Harvester-Urban land complex, 2 to 9 percent slopes. This map unit consists of areas of Urban land and gently sloping to moderately sloping Harvester soil on upland ridges and upper side slopes. It is 50 to 65 percent Harvester soil and 20 to 35 percent Urban land. Individual areas are generally rectangular and range from 20 to 100 acres. The Urban land areas and Harvester soil are so intermingled or so small in size that they could not be shown separately at the scale selected for mapping.

This Harvester soil formed in silty loess materials, the upper 20 to 40 inches of which has been transported and shaped by earthmoving equipment. Typically, the Harvester soil has a surface layer of brown silt loam about 2 inches thick. Below this, to a depth of about 31 inches, are alternating layers of multicolored silt loam and silty clay loam. Underlying this fill material to a depth of 67 inches or more is part of an older silty soil. It is dark yellowish brown in the upper part and brown in the lower part. In some areas, the disturbed material is deeper than 40 inches. Also, there are small areas of undisturbed soil.

Included with this complex in mapping, and making up less than 5 percent of the unit, are areas of moderately well drained soils on narrow stream bottoms. These soils also formed partly in disturbed fill.

The Urban land part of the unit is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that classification is not practical.

The permeability of the Harvester soil is moderately slow. The available water capacity is high. Shrinking and swelling are moderate. The organic matter content is low, and natural fertility is medium. Reaction ranges from neutral to medium acid in all layers.

The Harvester soil is used for parks, open space, building sites, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. In some places, soil compaction is caused by heavy equipment. The existence of this problem and the best method of handling it need to be determined by onsite investigation. Soil erosion is a serious hazard during construction if the disturbed soils are left bare for a considerable length of time.

The Harvester soil is moderately limited for building sites by shrinking and swelling. Footings, foundations,

Figure 12.—Orchardgrass hay on a narrow ridgetop of Weller silt loam, 5 to 9 percent slopes. Goss cherty silt loam is on the wooded side slopes.

and basement walls should be adequately reinforced to prevent damage from shrinking and swelling. Waste disposal is generally handled by commercial systems. Using adequate base material and constructing the subgrade to shed water as well as providing side ditches and culverts help prevent damage to local roads and streets from low strength and frost action.

This complex is not assigned to a capability subclass or a woodland ordination.

54D—Harvester-Urban land complex, 9 to 14 percent slopes. This map unit consists of areas of strongly sloping Harvester soil on side slopes and Urban land. It is 60 to 75 percent Harvester soil and 15 to 25 percent Urban land. Individual areas range from 5 to 30 acres. The Harvester soil and Urban land areas are so intermingled, or so small in size, that they could not be shown separately at the scale selected for mapping.

Harvester soils formed in silty loess materials, of which the upper 20 to 40 inches has been transported and shaped by earthmoving equipment. Typically, the upper 37 inches of the profile is alternating layers of multicolored silt loam and silty clay loam. Underlying this fill material and extending to a depth of 60 inches or more is part of an older soil. It is dark brown silty clay loam. In some places, the disturbed material is deeper than 40 inches. Also, there are small areas of undisturbed soils.

The Urban land part of the unit is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that classification is not practical.

Included with this complex in mapping, and making up 2 to 5 percent of the unit, are small disturbed areas of moderately well drained soils on narrow stream bottoms.

This Harvester soil has moderately slow permeability. The available water capacity is high. Shrinking and swelling are moderate. The organic matter content is low, and natural fertility is medium. Reaction ranges from

neutral to medium acid in all layers. Surface runoff from bare soil is rapid.

This Harvester soil is used for parks, open space, building sites, lawns, and gardens. It is suited to grasses, flowers, trees, and shrubs. In some places, soil compaction is caused by heavy equipment. The existence of this problem and the best method of handling it need to be determined by onsite investigation. Soil erosion is a serious hazard during construction if the disturbed soils are left bare for a considerable time.

This Harvester soil is moderately limited for building sites because of slope and shrinking and swelling. Footings, foundations, and basement walls need to be adequately reinforced to prevent damage from shrinking and swelling. Waste disposal is generally handled by commercial systems. Using adequate base material and constructing the subgrade to shed water as well as providing side ditches and culverts help prevent damage to local roads and streets from low strength and frost action.

This complex is not assigned to a capability subclass or a woodland ordination.

62—Edinburg silty clay loam. This nearly level, poorly drained soil is on high terraces. Ponding after heavy rains is common. Individual areas are irregular in shape and range from 10 to about 200 acres.

Typically, the surface layer is very dark gray silty clay loam about 4 inches thick. The subsurface layer is silty clay loam about 16 inches thick. It is very dark gray in the upper part and black in the lower part. The subsoil is about 24 inches thick. It is dark grayish brown, mottled, firm silty clay in the upper part and grayish brown, mottled, firm silty clay loam in the lower part. The underlying material to a depth of 60 inches or more is light olive gray, firm silty clay loam.

Permeability and surface runoff are slow. The available water capacity is high. A seasonal high water table is near or above the surface during spring. The shrink-swell potential is high. Reaction ranges from medium acid to neutral in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is high, and the organic matter content is moderate. The surface layer is friable.

Nearly all areas of this soil are used for cultivated crops. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. The erosion hazard is slight. The return of crop residue to the soil or the regular addition of other organic material improves fertility and increases water infiltration.

This soil is suitable for building sites and sewage lagoons if proper design and installation procedures are used to overcome ponding and the high shrink-swell potential. Footings and foundations should be adequately reinforced on well-compacted and raised soil to prevent damage from shrinking and swelling. Installing drainage tile around footings and foundations helps prevent damage from excessive wetness. Sewage lagoons will function if adequate surface drainage is provided. Constructing roads on well compacted fill material with adequate base material and providing side ditches and culverts help prevent damage from low strength and ponding.

This soil is in capability subclass IIw. It is not assigned to a woodland ordination.

63B—Herrick silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad upland divides. Individual areas are generally long, straight ridgetops and range from 10 to 200 acres.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The subsurface layer is very dark grayish brown and dark grayish brown silt loam about 13 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is brown and dark grayish brown, mottled silty clay loam, and the lower part is brown, mottled silty clay loam. In a few small areas, glacial material is within 40 inches of the surface.

Included with this soil in mapping, and making up less than 5 percent of the unit, are small areas of moderately well drained Weller soils that have somewhat steeper slopes.

Permeability of this Herrick soil is moderately slow. Surface runoff is slow. The available water capacity is very high. A seasonal high water table is at a depth of 1 foot to 3 feet during the spring. The shrink-swell potential is high. Reaction ranges from medium acid to strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is high, and the organic matter content is moderate. The surface layer is friable and easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. If the soil is used for cultivated crops, there is an erosion hazard. Minimum tillage, winter cover crops, and grassed waterways help prevent excessive soil loss. In some areas slopes are long and smooth enough to be terraced and farmed on the contour. The return of crop residue to the soil or the regular addition of other organic material improves fertility and increases water infiltration.

The use of this soil for pasture and hay is also effective in controlling erosion. Overgrazing should be avoided. Proper stocking, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is suitable for building sites and sewage lagoons if proper design and installation procedures are used to overcome wetness and the high shrink-swell potential. Damage from shrinking and swelling can be reduced by adequately reinforcing footings, foundations, and basement walls. Wetness can be reduced by installing drainage tile around footings and foundations.

Sewage lagoons are suitable if the site can be leveled. This soil does not have sufficient strength to support vehicular traffic, but this can be corrected by strengthening the base with crushed rock or other suitable material. Side ditches and culverts can provide proper drainage to help prevent damage from shrinking and swelling and frost action.

This soil is in capability subclass IIe. It is not assigned to a woodland ordination.

67E—Menfro silt loam, karst, 5 to 20 percent slopes. This moderately sloping to moderately steep, well drained soil is in areas that contain numerous sinkholes. Topographically, a sinkhole is a depression that varies in depth from a small indentation of a few feet to a maximum of 100 feet or more. Most of them vary in depth from 10 to 30 feet. They range in area from a few square yards to an acre or more. The most common form is a funnel-shaped depression, but there are variations. Individual areas of this unit are irregular in shape and range from 5 to 20 acres.

Typically, the surface layer is brown silt loam about 4 inches thick. The subsoil is about 38 inches thick. It is dark yellowish brown silt loam in the upper part and brown silty clay loam in the lower part. The underlying material to a depth of 60 inches or more is brown silt loam. In some areas, limestone bedrock outcrops in the bottom of the sinkholes.

Permeability of this Menfro soil is moderate, and surface runoff is medium to rapid. The available water capacity is high. Shrinking and swelling are moderate. Reaction ranges from slightly acid to medium acid in the subsoil. Natural fertility is medium, and the organic matter content is moderately low.

Most areas of this soil are in woodland or pasture. Some areas are used for low-density housing. This soil is suitable for cultivated crops in areas where the sinkholes are not so deep and numerous that they hinder the use of farm equipment. The main concern for farming is the limitation placed on equipment use by the size and number of sinkholes as well as slope and the hazard of erosion. Erosion can be controlled by minimum tillage and a suitable cropping system. Wet spots on the bottom of some sinkholes are a concern.

The use of this soil for pasture and hay is effective in controlling erosion. Overgrazing should be avoided. Proper stocking, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees, and many areas have stands of native hardwoods. Woodland is probably the best use in those areas where the number and size of the sinkholes restrict the use of farm equipment. Most stands need selective cutting to thin them and remove undesirable trees. They also need protection from fire and grazing. These practices also improve the habitat for woodland wildlife, especially white-tailed deer and turkey.

This soil is suitable for building sites, particularly the moderately sloping areas between sinkholes. A detailed onsite investigation is needed, however. Some areas of this Menfro soil are suitable for septic tank absorption fields, mainly the less sloping areas between the sinkholes. There is a potential danger, however, of polluting the ground water if sewage seeps into the sinkholes. Because sinkholes are a geologic rather than a soil problem, anyone considering urban development of these areas should consider a geologic investigation.

This soil is in capability subclass IVe and woodland ordination 3o.

70—Booker clay. This nearly level, very poorly drained, very slowly permeable soil is along low-lying drainageways and in broad depressional areas on the Missouri River flood plains. Most areas are subject to frequent flooding when the Missouri River approaches flood stage. Ponding after heavy rains is common. Individual areas are generally long and range from 5 to several hundred acres.

Typically, the surface layer is very dark gray, firm clay about 12 inches thick. The subsoil is about 25 inches thick. It is very dark gray, firm clay in the upper part and dark gray, firm clay in the lower part. The underlying material to a depth of 60 inches or more is dark gray, firm clay. A few areas have a silt loam or very sandy loam overwash.

Permeability of this Booker soil is very slow. Surface runoff is very slow, and ponding after rain is common. The available water capacity is moderate. The high water table fluctuates from 6 inches above to 1 foot below the surface during winter, spring, and early summer months. The shrink-swell potential is high. Reaction is neutral to mildly alkaline. Natural fertility is medium, and the organic matter content is moderate. The surface layer is firm and rather difficult to till. It also has a tendency to crust or puddle after hard rains. Root development is restricted by poor aeration and the high water table.

Most areas of this soil are used for row crops, mainly soybeans and wheat, and it is best suited to this use. Because of wetness during spring and fall, row crops that require a short growing season are best suited to this soil. Tillage is difficult, and seedbeds should be prepared when the soil is at optimum moisture content. Artificial drainage is important to the success of a crop.

Mixtures of pasture and hay plants that contain water-tolerant varieties do well on this soil. Deep-rooted legumes are poorly suited because of the high water table. Timely deferment of grazing during wet periods and proper stocking help to keep the pasture and soil in good condition.

This soil is suited to water-tolerant trees. A few areas remain in timber. Equipment limitation, seedling mortality, windthrow hazard, and plant competition are severe. Equipment operation should be limited to periods when the soil is dry or frozen. Ridging the soil and planting

larger than usual stock on the ridges help achieve a better rate of survival. Lighter, less intensive thinning of stands reduces windthrow. Prescribed burning or spraying or cutting reduces plant competition.

This soil is generally unsuitable for building sites and septic tank absorption fields because of frequent flooding.

This soil is in capability subclass IIIw and woodland ordination 4w.

71—Waldron silty clay. This nearly level, somewhat poorly drained soil is along low-lying drainageways and in depressional areas on the river flood plains. Runoff from higher areas causes ponding after heavy rains. Most areas of this soil are protected by levees but may flood if a levee breaks or if runoff is received from adjacent areas. Individual areas are generally long and variable in width and range from 5 to 100 acres or more.

Typically, the surface layer is very dark grayish brown, firm silty clay about 6 inches thick. The underlying material to a depth of 60 inches or more is grayish brown and dark grayish brown, mottled, firm silty clay. In some places, there is a sandy substratum from 40 to 60 inches. Also, in a few areas the surface layer is silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Blake soils and the moderately well drained Haynie soils. They are on narrow ridges and low natural levees and make up about 5 percent of the unit.

Permeability and surface runoff are slow. The available water capacity of this Waldron soil is moderate. A fluctuating high water table is at a depth of 1 foot to 3 feet during winter, spring, and early summer. The shrink-swell potential is high. Reaction ranges from slightly acid to moderately alkaline. Natural fertility is medium, and the organic matter content is moderate. The surface layer is firm and rather difficult to till. It also has a tendency to crust or puddle after heavy rains. Root development is restricted to some extent by poor aeration.

Nearly all areas of this soil are used for row crops. This soil is suited to soybeans, corn, and small grains (fig. 13). Tillage is difficult because of wetness and the high clay content. Scheduling tillage operations during periods of optimum moisture and removing excess water by proper drainage are important to successful cropping.

Mixtures of pasture and hay plants that contain water-tolerant varieties grow well on this soil. The timely deferment of grazing during wet periods helps to keep pastures in good condition.

This soil is generally unsuitable for building sites and septic tank absorption fields because of rare flooding.

This soil is in capability subclass IIw and woodland ordination 2c.

72—Blake silty clay loam. This nearly level, somewhat poorly drained soil is along shallow drainageways and on low natural levees on the Missouri River flood plain. Most areas of this soil are protected by levees but may flood if a levee breaks or runoff is received from adjacent areas. Individual areas are generally long and narrow and range from 5 to 100 acres or more.

Typically, the surface layer is very dark grayish brown silty clay loam about 8 inches thick. The underlying material to a depth of 60 inches or more is dark grayish brown silty clay loam with thin strata of silty clay and very fine sandy loam. In some areas there are sandy substrata at some depth between 40 and 60 inches.

Included with this soil in mapping are small areas of lighter-textured Haynie soils on narrow ridges and small areas of heavier-textured Waldron soils in low, narrow drainageways. Also included on narrow natural levees are areas of a soil that is less than 40 inches deep to sand. Total inclusions make up less than 10 percent of the unit.

Permeability of this Blake soil is moderate. The available water capacity is high, and surface runoff is slow. Shrinking and swelling in the surface layer are moderate. Reaction ranges from neutral to moderately alkaline. Natural fertility is high, and the organic matter content is moderately low. The surface layer is friable and fairly easy to till. It does have a tendency to crust after hard rains. Root development is restricted by a fluctuating high water table at a depth of 2 to 4 feet during winter and spring.

Nearly all areas of this soil are used for row crops. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Surface drainage is required in low areas. Tillage is not usually a problem but should be delayed in the spring until the soil has had a chance to dry out.

This soil is suited to pasture or hay, although few areas are used for this. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is generally unsuitable for building sites and septic tank absorption fields because of rare flooding.

This soil is in capability class I. It is not assigned to a woodland ordination.

73—Haynie silt loam. This nearly level, well drained soil is on broad natural levees of river flood plains. Most areas of this soil are protected by levees but may flood if a levee breaks or runoff is received from adjacent areas. Individual areas are generally wide and long and range from 10 to 200 acres or more.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The underlying material is dark grayish brown very fine sandy loam to a depth of about 52 inches, and it is stratified grayish brown loamy very fine sand to a depth of 60 inches or more. In some

Figure 13.—Soybeans growing on somewhat poorly drained Waldron silty clay.

areas the surface layer is loam or silty clay loam. Some places also have a substratum that ranges from very fine silt to loamy fine sand.

Included with this soil in mapping are areas of somewhat poorly drained Blake soils in depressions and coarser-textured Carr soils on slightly higher ridges. These soils make up about 2 to 10 percent of the unit.

Permeability of this Haynie soil is moderate, and surface runoff is slow. The available water capacity is very high. The organic matter content is moderately low, and natural fertility is high. Reaction ranges from neutral to moderately alkaline. The surface layer is friable and very easily tilled.

Nearly all areas of this soil are used for row crops. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Where this soil is protected from flooding, there are no real limitations for agricultural uses.

This soil is generally unsuitable for building sites and septic tank absorption fields because of rare flooding.

This soil is in capability class I and woodland ordination 2o.

74—Carr fine sandy loam. This nearly level, well drained soil is on narrow ridges and high natural levees of the Missouri River flood plains. Most areas of this soil are protected by levees but may flood in case a levee breaks or runoff is received from adjacent areas. Individual areas are generally long and finger-shaped and usually range from 5 to 100 acres.

Typically, the surface layer is dark grayish brown fine sandy loam about 15 inches thick. The underlying material to a depth of 60 inches or more is dark grayish brown fine sandy loam in the upper part and pale brown fine sand in the lower part. In some areas the surface layer is loam or silt loam.

Included with this soil in mapping are small acreages of slightly heavier-textured Haynie soils in lower areas and the coarser-textured Hodge soils on slightly higher rounded mounds (fig. 14). Also included are areas of a soil that has a silty clay loam surface layer less than 10

inches thick underlain by sand. Inclusions make up about 15 percent of the unit.

Permeability of this Carr soil is moderately rapid, and surface runoff is slow. The available water capacity is moderate. The organic matter content is low, and natural fertility is medium. Reaction is moderately alkaline. The surface layer is friable and very easily tilled.

Most areas of this soil are used for row crops. Where irrigated, this soil is suited to corn, soybeans, small grains, and grasses and legumes. Where irrigation is not used, grain sorghum or alfalfa produces the best results. The center-pivot and traveling-gun irrigation systems are best suited to this soil. The moderately rapid permeability makes irrigation by flooding impractical.

Wind erosion in the winter months is also a management problem on this soil. This is best controlled by planting a cover crop after fall harvest and using only spring plowing or minimum tillage for summer crops.

This soil is suited to pasture or hay. Because the surface layer is fine sandy loam, however, overgrazing quickly destroys grass stands. Proper stocking and restricted use during summer months help maintain good pastures.

A few frequently flooded areas of this soil are best used for woodland. Wildlife also use these areas for protection and cover. Deer, rabbits, squirrels, and quail are generally abundant. There are only slight limitations for planting or harvesting trees.

This soil is generally unsuitable for building sites and for septic tank absorption fields because of rare flooding.

This soil is in capability subclass IIs and woodland ordination 3o.

75—Hodge loamy fine sand. This nearly level, somewhat excessively drained soil is in broad areas on river banks and on narrow natural levees. Most areas are subject to frequent flooding. Individual areas are irregular in shape and range from 5 to 100 acres.

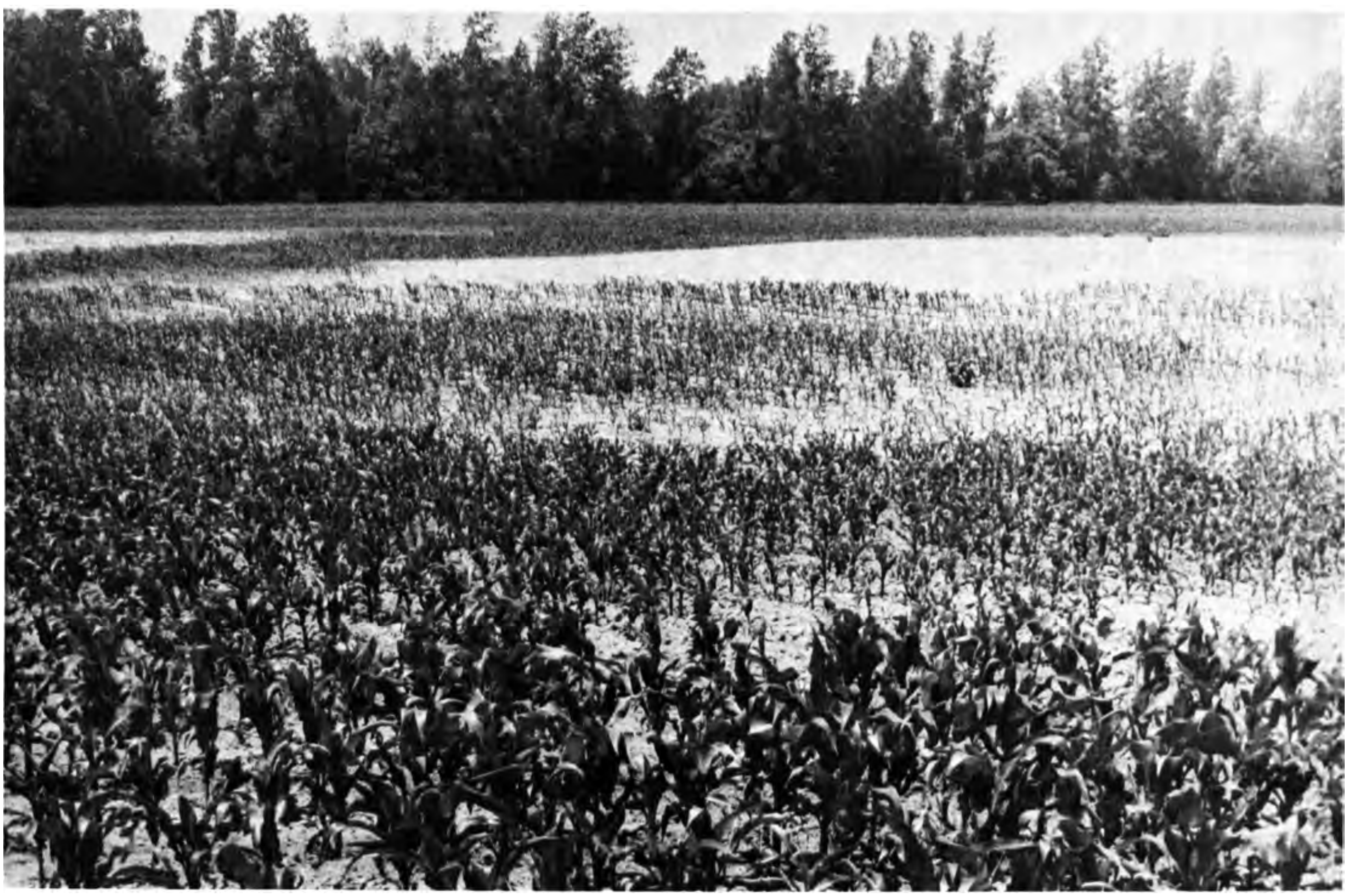


Figure 14.—The taller corn in the foreground is growing on Carr fine sandy loam. The poorer stand of corn in the middle of the field is in a droughtier area of Hodge loamy fine sand. White areas in the background where the corn has failed are on inclusions of sand commonly found in the Hodge map unit.

Typically, the surface layer is dark brown loamy fine sand about 7 inches thick. The underlying material to a depth of 60 inches or more is stratified, brown, grayish brown, and dark grayish brown fine sand, very fine sand, very fine sandy loam, and loamy fine sand. In some areas, the surface layer is fine sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Blake soils. They are in depressional areas and narrow drains and make up about 5 percent of the unit.

Permeability of this Hodge soil is rapid, and surface runoff is slow. The available water capacity is low. The organic matter content is low, and natural fertility is medium. Reaction is mildly alkaline throughout. The surface layer is very friable and easily tilled throughout a wide range in moisture content.

Nearly all leveed areas of this soil are used for row crops. Because of the coarse textures and low available water capacity, this soil is not well suited to cultivated crops. Irrigation, however, can greatly improve the productivity of this soil. Because of rapid permeability, irrigation by flooding is impractical, and frequent irrigation is necessary for best results. Grain sorghum and alfalfa respond well to irrigation on this soil.

Wind erosion and the low level of organic matter are also common management problems. Wind erosion can be reduced by using only spring plowing or minimum tillage for summer crops or planting a cover crop after the fall harvest. The organic matter content can be increased by application of manure or plowing under a crop, such as sudangrass, for green manure.

When irrigation and heavy equipment are used, soil compaction can become a problem. This can restrict root penetration and reduce yields, but occasional deep cultivation helps to overcome it.

This soil is suited to trees and to woodland wildlife habitat. Areas unprotected from flooding are best used for this purpose. Seedling mortality is moderate. Using a special planting stock of larger size than usual may be necessary to achieve a better rate of plant survival. Deer and small game are also well suited to this environment.

Unleveed areas of this soil are generally unsuitable for building sites and septic tank absorption fields because of frequent flooding.

This soil is in capability subclass IIIw and woodland ordination 1s.

76—Haynie-Blake complex. This map unit consists of nearly level, well drained and somewhat poorly drained soils on the Missouri River flood plains. It is 50 to 60 percent Haynie soils and 40 to 50 percent Blake soils. Some areas of this soil are protected by levees but may flood in case of a levee break. Individual areas range from 20 to several hundred acres. The Haynie soils are on natural levees. The Blake soils are along narrow drainageways. These soils are so intermingled, or so small in size, that they could not be shown separately at the scale selected for mapping.

Typically, the Haynie soil has a surface layer of very dark grayish brown silt loam about 10 inches thick. The underlying material is dark grayish brown very fine sandy loam and grayish brown loamy very fine sand to a depth of 60 inches or more.

Typically, the Blake soil has a surface layer of very dark grayish brown silty clay loam about 8 inches thick. The underlying material to a depth of 60 inches or more is dark grayish brown silty clay loam with thin strata of coarser and finer material. In some areas the surface layer is loam or silt loam.

Included with these soils in mapping are some areas of a soil that is less than 40 inches deep to sand. This inclusion makes up less than 5 percent of the unit.

Permeability of the Haynie and Blake soils is moderate, and surface runoff is slow. The available water capacity is very high in the Haynie soil and high in the Blake soil. A seasonal high water table is at a depth of 2 to 4 feet in the Blake soil during winter and spring. Reaction ranges from slightly acid to mildly alkaline. Natural fertility is high in both soils. The organic matter content is moderately low.

Most areas of these soils are in woodland. These soils are well suited to trees. There are only slight limitations for planting and harvesting trees. Areas of these soils are also well suited to woodland wildlife habitat. It grows especially well on the Haynie soil.

These soils are suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Most areas need protection from flooding. The low-lying areas of the Blake soil need surface drainage.

The soils in this unit are generally unsuitable for building sites because of occasional flooding.

This complex is in capability class I, and the woodland ordination for Haynie soils is 2o and for Blake soils is 1o.

77—Hodge-Blake complex. This map unit consists of nearly level, somewhat excessively drained and somewhat poorly drained soils on the Missouri River flood plain. It is 50 to 60 percent Hodge soils, 30 to 40 percent Blake soils, and about 5 to 10 percent other soils. Individual areas range from 40 to several hundred acres. Most areas are subject to frequent flooding. The Hodge soils are on natural levees and alluvial fans. The Blake soils are in narrow, low drainageways. These soils are so intermingled, or so small in size, that they could not be shown separately at the scale selected for mapping.

Typically, the Hodge soil has a surface layer of dark brown loamy fine sand about 7 inches thick. The underlying material is stratified brown fine sand and dark brownish gray very fine sandy loam in the upper part and brown loamy fine sand and grayish brown fine sand in the lower part. In some areas, the surface layer is fine sand.

Typically, the Blake soil has a surface layer of very dark grayish brown silty clay loam about 8 inches thick. The underlying material to a depth of about 60 inches or more is stratified dark grayish brown silty clay loam.

Included with these soils in mapping are areas of some soils that are stratified throughout with clayey, silty, and sandy material. Also included are some areas of sand. Total inclusions make up 5 to 10 percent of the unit.

Permeability is rapid in the Hodge soil and moderate in the Blake soil. The available water capacity is low in the Hodge soil and high in the Blake soil. Reaction ranges from neutral to moderately alkaline in both soils.

Nearly all areas of these soils are in woodland. These soils are well suited to trees. Most stands need improvement for maximum yields. Seedling mortality is moderate on the Hodge soil. Using a special planting stock of a larger size than usual may be necessary to achieve a better rate of plant survival.

These soils are generally unsuitable for cultivated crops or for building sites because of frequent flooding.

This complex is in capability subclass IIIw, and the woodland ordination for Hodge soils is 1s and for Blake soils is 1o.

79—Dupo silt loam. This nearly level, somewhat poorly drained soil is on alluvial fans and outwash areas on river flood plains. It is subject to frequent flooding. Individual areas are irregular in shape and range from 5 to more than 100 acres.

Typically, the surface layer is dark brown silt loam about 10 inches thick. The substratum is mottled, dark brown silt loam about 10 inches thick. The next 16 inches is a buried surface layer that is very dark grayish brown, firm silty clay loam in the upper part and very dark gray, firm silty clay in the lower part. The underlying material to a depth of 60 inches or more is firm, dark gray clay. In some places, the buried surface layer is less than 20 inches deep.

Included with this soil in mapping are small areas of moderately permeable Dockery soils on high spots. This inclusion makes up 5 percent of the unit.

Permeability and surface runoff are slow. The available water capacity of this Dupo soil is high. A seasonal high water table is at a depth of 1 foot to 3 feet during winter and spring. The shrink-swell potential is high. Reaction ranges from slightly acid to medium acid throughout. Natural fertility is high, and the organic matter content is moderately low. The surface layer is very friable and easily tilled throughout a wide range in moisture content.

Nearly all areas of this soil are used for cultivated crops. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Wet spots in the field can be corrected by land grading and smoothing. Returning crop residue to the soil helps maintain fertility and tilth. If this soil is used for pasture, overgrazing and grazing when the soil is too wet should be avoided. Proper stocking, pasture rotation, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is generally unsuitable for building sites and septic tank absorption fields because of frequent flooding.

This soil is in capability subclass IIIw. It is not assigned to a woodland ordination.

80—Portage clay. This nearly level, very poorly drained soil is along low-lying drainageways and broad depressional areas on the Mississippi River flood plain. Most areas occasionally flood when the Mississippi River overflows its banks. Ponding after heavy rain is common. Individual areas are generally long and broad and range from 10 to 900 acres or more.

Typically, the surface layer is black, firm clay about 4 inches thick. The subsurface layer, about 10 inches thick, is very dark gray, firm clay in the upper part and very dark grayish brown, firm clay in the lower part. The subsoil extends to a depth of 75 inches or more. It is dark gray, firm clay in the upper part and dark grayish brown clay in the lower part.

Permeability and surface runoff are very slow. Ponding after rain is common. The available water capacity is moderate. A fluctuating high water table is near the surface or ponded during winter, spring, and early in summer. The shrink-swell potential is very high. Reaction ranges from medium acid to very strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is medium, and the organic matter content is moderate. The surface layer is firm and rather difficult to till. It also has a tendency to crust or puddle after hard rains. Root development is restricted by poor aeration.

Nearly all areas of this soil are used for row crops. This soil is dominantly cropped to soybeans and wheat, for which it is best suited. Row crop varieties that require a short growing season are best suited to the wet spring and fall. Tillage is difficult, and seedbeds should be prepared when the soil is at optimum moisture content. Drainage by means of surface ditching or land leveling and the timely scheduling of tillage operations are important in the success of the crop.

Mixtures of pasture and hay plants that contain water-tolerant varieties grow well on this soil. Timely deferment of grazing during wet periods helps to keep the pasture and soil in good condition.

This soil is suited to water-tolerant trees. A few areas remain in woodland. Equipment limitation, seedling mortality, windthrow hazard, and plant competition are severe. Equipment should be operated when the soil is dry or frozen. Ridging the soil and planting larger than usual stock on the ridges help achieve a better rate of plant survival. Lighter, less intensive thinning of stands reduces windthrow. Prescribed burning or spraying or cutting reduces plant competition.

This soil is generally unsuitable for building sites and septic tank absorption fields because of occasional flooding.

This soil is in capability subclass IIIw and woodland ordination 4w.

81—Haymond silt loam. This nearly level, well drained soil is on alluvial flood plains along rivers and stream branches. Most areas are subject to occasional flooding for brief periods. Individual areas are generally long and variable in width and range from 10 to 75 acres.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The substratum is brown silt loam to a depth of 60 inches or more. In some places, the surface layer is thicker and darker.

Included with this soil in mapping are a few areas of somewhat poorly drained Dockery soils in shallow depressions. Also included are some areas of Sensabaugh soils that contain more sand or coarse fragments than the Haymond soil. These areas generally are narrow bands along stream channels or in the upper reaches of narrow drainageways. Total inclusions make up about 10 percent of the unit.

Permeability of this Haymond soil is moderate, and surface runoff is slow. The available water capacity is very high. Reaction ranges from medium acid to neutral. Natural fertility is high, and the organic matter content is moderately low. The surface layer is friable and easily tilled throughout a wide range in moisture content.

Nearly all areas of this soil are used for row crops. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. There are no major agricultural problems associated with this soil. Minor problems include occasional flooding for brief periods and streambank cutting.

This soil is suited to trees, although only a few areas that are too small or inaccessible to be practical for farming remain in woodland. Plant competition is moderate. It can be reduced by site preparation or by prescribed burning or spraying or cutting.

This soil is generally unsuitable for building sites and septic tank absorption fields because of occasional flooding.

This soil is in capability subclass IIw and woodland ordination 1o.

82—Chequest silt loam. This nearly level, poorly drained soil is on low natural levees on the Mississippi River flood plain. Most areas are subject to occasional flooding. Individual areas are irregular in shape and range from 10 to 25 acres.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is about 40 inches thick. It is dark grayish brown, firm silty clay in the upper part and dark grayish brown, firm silty clay loam in the lower part. Some areas have a lighter colored overwash on the surface.

Permeability of this Chequest soil is moderately slow, and surface runoff is slow. The available water capacity is moderate. A seasonal high water table is at a depth of 1 foot to 3 feet during late winter and early spring. The shrink-swell potential is high. Reaction is medium acid to strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is medium, and the organic matter content is moderate. The surface layer is friable and easily tilled when the soil is dried out in the spring.

Most areas of this soil are used for cultivated crops. This soil is suited to soybeans, corn, small grains, and grasses and legumes for hay and pasture. Artificial drainage is needed. Wet spots can be eliminated by land grading and shaping.

Mixtures of pasture and hay plants that contain water-tolerant varieties do well on this soil. Deep-rooted legumes, such as alfalfa, generally do not grow well because of the high water table. Proper stocking and the timely deferment of grazing during wet periods help keep the pasture and soil in good condition.

This soil is suited to trees, and several low-lying areas remain in woodland. Although wetness is a severe limitation for planting and harvesting trees, the low-lying areas are generally best left in woodland because they flood so frequently. Wetness can be overcome to some extent by the scheduling of equipment to be used when the soil is dry and firm. Tree plantings grow best if competing vegetation is removed or destroyed. This can be accomplished through site preparation by mechanical or chemical means. Seedling mortality may be a problem because of wetness of the soil. Ridging the soil and planting on the ridges increase seedling survival. The moderate windthrow hazard can be reduced by several light thinnings of the stand.

This soil is generally unsuitable for septic tank absorption fields and building sites because of occasional flooding.

This soil is in capability subclass IIw and woodland ordination 3w.

83—Lomax loam. This nearly level, well drained soil is on the high terrace that separates the Missouri River and Mississippi River flood plains. It is subject to rare flooding. Individual areas are long and narrow and range from 10 to 50 acres.

Typically, the surface layer is very dark gray loam about 7 inches thick. The subsurface layer is very dark grayish brown and dark brown very fine sandy loam about 17 inches thick. The subsoil, about 16 inches thick, is yellowish brown very fine sandy loam. The underlying material to a depth of 60 inches or more is pale brown loamy very fine sand. In some places, the surface layer is silt loam. Also, in some places, the

surface layer is less than 24 inches thick. Some areas contain more clay and less sand.

Included with this soil in the mapping are some long narrow strips along the highest part of the terrace that are sandy throughout. Also included is a short, steep escarpment along the south and east edge of the terrace. Total inclusions make up about 5 percent of the unit.

Permeability of this Lomax soil is moderately rapid, and surface runoff is slow. The available water capacity is high. Reaction ranges from medium acid to neutral in the surface layer and from medium acid to strongly acid in the subsoil. Natural fertility is high, and the organic matter content is moderate. The surface layer is friable and easily tilled throughout a wide range in moisture content.

Nearly all areas of this soil are used for cultivated crops. This soil is highly productive and well suited to corn, soybeans, small grains, vegetable crops, and grasses and legumes for hay and pasture. The sandy areas are droughty and need irrigation for top yields.

This soil is suitable for building sites and septic tank absorption fields if measures are taken to overcome rare flooding. Buildings and septic tank absorption fields should be located above known flood levels or constructed on raised, well-compacted fill material above the flood level. Well compacted, raised roadbeds properly drained by side ditches and culverts help prevent damage from frost action and flooding.

This soil is in capability class I. It is not assigned to a woodland ordination.

84—Blase silty clay loam. This nearly level, somewhat poorly drained soil is on the high terrace that separates the Missouri and Mississippi River flood plains. It is subject to rare flooding. Individual areas are generally long and narrow and range from 10 to about 40 acres.

Typically, the surface layer is about 10 inches thick. It is very dark gray silty clay loam. The subsurface layer is very dark gray, firm silty clay about 7 inches thick. The subsoil, about 15 inches thick, is grayish brown, firm silty clay. The underlying material to a depth of 60 inches or more is brown loam in the upper part and brown very fine sandy loam in the lower part. In some places, the underlying material is more sandy. Also, in a few areas the surface layer is silty clay.

Included with this soil in mapping are a few small areas of well drained Lomax soils at slightly higher elevations. This inclusion makes up less than 5 percent of the unit.

Permeability of this Blase soil is slow in the clayey upper part and moderate in the loamy lower part. The available water capacity is high. The shrink-swell potential is high. Surface runoff is slow. Reaction is medium acid to neutral in most of the rooting zone. Natural fertility is medium, and the organic matter content is moderate. The surface layer ranges from friable to firm and is fairly easy to till when at optimum moisture content.

Nearly all areas of this soil are used for cultivated crops. This soil is suited to soybeans, corn, small grains, and grasses and legumes for hay and pasture. Tillage is not generally a problem but should be delayed in the spring until the soil has had a chance to dry out.

This soil is suited to pasture or hay, although very few areas are used for this. Grazing should be limited during wet periods.

This soil is suitable for building sites and septic tank absorption fields if measures are taken to overcome rare flooding. Any buildings should be located above known flood levels or constructed on raised, well-compacted fill material to prevent damage from flooding and wetness. Foundations and footings should be adequately reinforced to prevent damage from shrinking and swelling. Berms of lagoons should be constructed high enough to prevent overtopping by floodwaters. The bottom of lagoons should be sealed to prevent seepage and contamination of ground water. This soil does not have sufficient strength to support vehicular traffic, but this can be overcome by strengthening the base with crushed rock or other suitable material. Well-compacted, raised roadbeds properly drained by side ditches and culverts help prevent damage from frost action, shrinking and swelling, and flooding.

This soil is in capability subclass IIw and woodland ordination 3c.

85—Carlow silty clay loam. This nearly level, poorly drained soil is on the Mississippi River flood plain. It is subject to occasional flooding. Individual areas are irregular in shape and range from 20 to several hundred acres.

Typically, the surface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsurface layer is very dark grayish brown, firm silty clay about 6 inches thick. The subsoil is about 26 inches thick. It is dark gray, firm silty clay. The underlying material to a depth of 60 inches or more is dark gray, firm silty clay.

Included with this soil in mapping are a few small areas of somewhat poorly drained Kampville soils on narrow natural levees. This inclusion makes up less than 2 percent of the unit.

Permeability and surface runoff are very slow. The available water capacity of this Carlow soil is moderate. The shrink-swell potential is high. A seasonal high water table is within a foot of the surface during late winter and early spring. Reaction is strongly acid and very strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is medium, and the organic matter content is moderate. The surface layer is friable and fairly easy to till after the soil has dried out in the spring.

Most areas of this soil are used for cultivated crops. Many low-lying areas remain in timber. Some areas are flooded late in fall to provide habitat for migratory birds. This soil is suited to soybeans, corn, small grains, and grasses and legumes for hay and pasture. Artificial drainage is needed, and wet spots can be removed by land grading and shaping.

Mixtures of pasture and hay plants that contain water-tolerant varieties grow well on this soil. Deep-rooted legumes, such as alfalfa, are generally not suited to this soil because of the high water table. Proper stocking and the timely deferment of grazing during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees, and many low areas remain in woodland. Although wetness is a severe limitation for planting and harvesting trees, the low areas are best left in woodland because they flood so frequently. Wetness can be overcome by scheduling the use of equipment during periods when the soil is dry or frozen. Existing stands need several light thinnings. Tree seedlings grow best if competing vegetation is removed or destroyed. This can be accomplished through site preparation by mechanical and/or chemical means. Seedling mortality may be a problem because of the wetness of the soil. Ridging the soil and planting on the ridges helps increase seedling survival.

This soil is generally unsuitable for building sites and septic tank absorption fields because of occasional flooding.

This soil is in capability subclass IIIw and woodland ordination 4w.

86—Kampville silt loam. This nearly level, somewhat poorly drained soil is in low-lying areas on the Mississippi River flood plains. It is subject to occasional flooding. Individual areas are irregular in shape and range from 25 to 200 acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer is grayish brown silt loam about 6 inches thick. The subsoil is about 28 inches thick. The upper part is grayish brown silty clay loam, and the lower part is dark grayish brown silty clay loam. The underlying material to a depth of 60 inches or more is grayish brown silty clay loam. In some areas, the surface layer is silty clay loam.

Included with this soil in mapping are small areas of browner Hurst soils on low, narrow, natural levees. This inclusion makes up less than 5 percent of the unit.

Permeability of this Kampville soil is moderately slow, and surface runoff is slow. The available water capacity is high. The shrink-swell potential is high. Reaction ranges from strongly acid to very strongly acid in the subsoil and varies widely in the surface layer due to local liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable and easily tilled.

Most areas of this soil are used for cultivated crops. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. Surface drainage is required in low areas.

This soil is suited to pasture or hay, although few areas are used for this. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is generally not suitable for building sites and septic tank absorption fields because of occasional flooding.

This soil is in capability subclass IIw and woodland ordination 2o.

90—Hurst silt loam. This nearly level, somewhat poorly drained soil is on low terraces and natural levees. Most areas are subject to rare flooding for brief periods. Individual areas are irregular in shape and range from 5 to 100 acres.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsurface layer, about 6 inches thick, is grayish brown silt loam. The subsoil extends to a depth of 60 inches or more. The upper part is dark grayish brown, mottled, firm silty clay loam, and the lower part is grayish brown, mottled, firm silty clay loam. In some places, the surface layer is silty clay loam.

Included with this soil in mapping are small areas of the grayer Kampville soils and poorly drained Carlow soils. They occupy shallow depressions and drainageways and make up 3 to 8 percent of the unit.

Permeability of this Hurst soil is very slow, and surface runoff is slow. The available water capacity is moderate. A seasonal high water table is at 1 foot to 3 feet during winter and spring. The shrink-swell potential is high. Reaction is medium acid to strongly acid in the subsoil and varies widely in the surface layer as a result of local liming practices. Natural fertility is medium, and the organic matter content is moderately low. The surface layer is friable. Root development is restricted by the compactness of the subsurface layer.

Most areas of this soil are used for cultivated crops. This soil is suited to corn, soybeans, small grains, and grasses and legumes for hay and pasture. It is well suited to small grains and cool-season grasses. Yields for summer annuals are reduced severely in dry years because of the restricted root growth. However, crops on this soil show a good response to irrigation. Spring tillage is often delayed because of wetness.

Mixtures of pasture and hay plants that contain drought-tolerant varieties do well on this soil. Wetness is a problem during late winter and early spring months because of slow internal drainage. Overgrazing or grazing during wet periods causes surface compaction and poor tilth. Proper stocking, pasture rotation, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is suited to trees, but few areas remain in native woodlands. Wetness is a moderate limitation for equipment use, but this can be overcome by scheduling equipment to be used when the soil is dry or frozen.

This soil is generally unsuitable for building sites and septic tank absorption fields because of rare flooding.

This soil is in capability subclass IIIw and woodland ordination 3o.

91—Pits, quarries. This map unit consists of areas of Pits and quarries from which the soil material has been removed in order to mine the underlying limestone or sandstone. These areas of Pits and fill materials are irregular in shape and range from 3 to 20 acres. They are mostly barren of vegetation.

These areas of Pits and quarries are not suited to cultivated crops, hay, pasture, or trees. They are not suitable for most engineering uses.

This map unit is not assigned to a capability subclass or a woodland ordination.

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U. S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited. The U. S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland.

Prime farmland, as defined by the U. S. Department of Agriculture, is the best land for producing food, feed, forage, fiber, and oilseed crops. This land has the soil quality, growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is treated and managed with acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland may now be used for crops, pasture, woodland, or similar purposes, but does not include urban or built-up land or water areas. It must either be used for producing food or fiber or be available for these uses.

Prime farmland receives an adequate and dependable supply of moisture from precipitation or irrigation. It also has a favorable temperature and growing season and an acceptable level of acidity or alkalinity. It has few or no rocks and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mostly from 0 to 6 percent. For more detailed information on the criteria for prime farmland, consult the local staff of the Soil Conservation Service or the Missouri University Extension Service.

About 175,000 acres, or nearly 45 percent, of St. Charles County meets the soil requirements for prime farmland. Areas are scattered throughout the county, but most are in the northern half, mainly in soil associations 3, 4, 6, and 7 of the general soil map. Approximately 150,000 acres of this prime farmland is used for crops. Crops grown on this land, mainly corn and soybeans, account for an estimated two-thirds of the county's total agricultural income each year.

A recent trend in land use in many areas of the county has been the loss of some prime farmlands to urban, suburban, and industrial uses. The loss of prime farmland to other uses puts pressure on marginal lands, which are then farmed although they are more erodible, droughty, difficult to cultivate, and generally less productive.

The map units that make up prime farmland in St. Charles County are listed in this section. This list does

not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed soil map units."

Soils that have limitations—a high water table or flooding—may qualify as prime farmland if these limitations have been overcome by such measures as drainage or flood control. In this survey area, some of the naturally wet soils have been adequately drained—by application of artificial measures or as the incidental result of farming, roadbuilding, or other kinds of land development. In the following list, soils with these limitations, if any, are noted. Onsite evaluation is necessary to see if these limitations have been overcome.

The map units that meet the soil requirements for prime farmland are:

3—Twomile silt loam (where drained)
7B—Menfro silt loam, 2 to 5 percent slopes
11—Dockery silt loam
12—Kennebec silt loam
13—Auxvasse silt loam (where drained)
35B—Mexico silt loam, 1 to 5 percent slopes (where drained)
37—Marion silt loam
40—Westerville silt loam (where drained)
41—Freeburg silt loam
44—Sensabaugh silt loam
48A—Weller silt loam, 0 to 2 percent slopes
48B—Weller silt loam, 2 to 5 percent slopes
62—Edinburg silty clay loam (where drained)
63B—Herrick silt loam, 2 to 5 percent slopes
70—Booker clay (where flooding during the growing season occurs once or less in 2 years)
71—Waldron silty clay (where drained)
72—Blake silty clay loam
73—Haynie silt loam
74—Carr fine sandy loam
76—Haynie-Blake complex
79—Dupo silt loam (where flooding during the growing season occurs once or less in 2 years)
80—Portage clay (where drained)
81—Haymond silt loam
82—Chequest silt loam (where drained)
83—Lomax loam
84—Blase silty clay loam
85—Carlow silty clay loam (where drained)
86—Kampville silt loam (where drained)
90—Hurst silt loam (where drained)

crops and pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 235,000 acres in St. Charles County were used for crops and pasture in 1967 (*12*). Of this total, 161,000 acres were used for corn and sorghum; 42,000 acres for soybeans; 48,120 for close-grown crops, predominantly wheat; and 18,962 in rotation hay and pasture. The rest was mostly permanent pasture, land in conservation use, and temporarily idle cropland. Since 1967, about 2,000 acres per year were taken out of crop production and used for urban and suburban development.

The potential of the soils in St. Charles County is good for sustained production of food. The 1967 Conservation Needs Inventory shows that only about half of the cropland in St. Charles County was adequately treated to meet conservation needs. Cropland that is not adequately treated is likely to be on uplands where erosion is in excess of what is considered tolerable for sustained production. Some of the marginal cropland used for row crops should be converted to pasture and hayland. Soil erosion on most of the cropland can be held to a tolerable amount by using conservation practices.

Urban and built-up areas are increasing at a rapid rate and present a threat to the level of crop production in St. Charles County. In 1967, about 22,579 acres were in urban and built-up areas (*12*). By 1978, this amount had doubled. At the present rate, about 2,000 acres per year of land in St. Charles County is converted to urban and built-up areas.

Soil drainage is a management concern on about one-third of the cropland in St. Charles County. These soils are naturally wet because of their position on the landscape or slow permeability, or both. Areas along the major rivers are flooded by runoff from the watershed. Clayey soils, such as Booker or Portage soils, are in positions on the landscape that receive runoff or overflow. When these very slowly permeable soils receive excess water, they pond water for long periods. The Carlow, Chequest, Kampville, Blake, and Waldron soils are either poorly drained or somewhat poorly drained. Excess water is removed from most of these soils by field ditches. A few areas have been shaped or graded to provide drainage, eliminate potholes, and make the soil suitable for irrigation.

Soil erosion is the major management concern on about two-thirds of the cropland and pasture in St.

Charles County. If slope is more than 2 percent, erosion is a hazard. Armster, Crider, Hatton, Herrick, Keswick, Menfro, Mexico, Weller, and Winfield soils all have slopes of more than 2 percent.

Loss of the surface layer through erosion reduces productivity and leaves the soil in poor tilth. The surface layer contains most of the nutrients and organic matter needed for plant growth. When the original surface layer is lost and the subsoil is in the plow layer, the tilth is difficult to maintain. Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil.

Erosion control protects the surface of the soil, reduces runoff, and increases water infiltration. A cropping system that keeps plant cover on the soil for extended periods reduces erosion and preserves the productive capacity of the soil. Control of erosion minimizes stream pollution by sediment and improves the quality of water for municipal and recreational uses as well as for fish and wildlife. Cover crops, permanent vegetation, minimum tillage, terraces, no-till cultivation, diversions, and mechanical practices are used to control erosion.

Wind erosion is a hazard on the Hodge and Carr soils where they are unprotected. Wind erosion not only causes soil loss but damages young plants. Winter cover crops and field windbreaks help to control wind erosion.

Most of the cropland in the uplands consists of sloping soils that are subject to damaging erosion if they are plowed in the fall.

Soil fertility is naturally low in some soils of the county. These soils, however, respond well to the addition of lime and fertilizer. Nearly all of the upland soils and the soils on the Mississippi River bottoms are naturally acid in the rooting zone, and they need applications of ground limestone. The soils on the Missouri River bottoms are naturally neutral to mildly alkaline in the upper part of the rooting zone and generally need little or no addition of limestone. On all soils, application of lime and fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected level of yields.

Soil tilth is an important factor in seedbed preparation and crop production. Soils with good tilth have granular structure in the surface layer, are easily tilled, and are porous. Where tilth is poor, an eroded surface puddles during heavy rainfall and, when dry, forms a hard crust that reduces water infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material improve soil tilth.

Most of the uneroded soils on the uplands and most of the soils on stream bottoms and terraces have a silt loam surface layer that is easily tilled and makes good seedbeds. Generally, the structure of silt loam soils becomes weaker if overtilled and compacted. The surface puddles after intense rainfall and crusts when dry.

The loamy fine sand and fine sandy loam surface layer of Hodge and Carr soils is easily tilled into a good seedbed but tends to be droughty and is subject to wind erosion in unprotected areas.

The silty clay loam, silty clay, and clay surface layer of such soils as Blake, Blase, Booker, Carlow, Portage, and Waldron soils is difficult to work into a good seedbed. If worked when wet, the surface tends to become a mass of hard clods when it dries. If it is plowed in fall or early in spring, subsequent rains generally melt the clods into small aggregates that make a more desirable seedbed.

Field crops, such as corn and soybeans, are suited to the soils and climate of the survey area and are commonly grown. Grain sorghum and sunflowers are grown on a few acres. Wheat is the most common close-growing crop.

Pasture and hay crops that are suited to the soils and climate of St. Charles County include several legumes, cool-season grasses, and warm-season native grasses. Alfalfa and red clover are the common legumes grown for hay. They are also used in mixtures that include bromegrass or orchardgrass. Birdsfoot trefoil can be used in pasture mixtures that include bromegrass, orchardgrass, fescue, and bluegrass.

Warm-season native grasses adapted to the survey area are big bluestem, indiangrass, and switchgrass. These grasses produce well during summer months, but special management is needed to establish them and for proper grazing use.

Deep, well drained and moderately well drained soils, such as Carr, Haynie, Menfro, and Winfield soils, are well suited to alfalfa. Other legumes and all grasses do well on most of the soils on the uplands. Because Booker, Carlow, Portage, and Waldron soils are flooded occasionally and stay wet for long periods, they are not suited to all grasses. They are better suited to short-season summer annuals.

The major concerns of pasture management are overgrazing and erosion. Grazing should be controlled to keep plants at maximum production. Grasses kept at a desirable height will reduce runoff and help control erosion.

Specialty crops grown in large areas of St. Charles County include grapes, apples, peaches, pears, berries, pecans, nursery plants, sod, and various vegetables. The deep, well drained Menfro soils are well suited to orchards, vineyards, and nurseries. The deep, well drained Lomax and Haymond soils are well suited to vegetable crops. The proximity of St. Charles County to the large St. Louis market area, along with the desirable soil and water resources, should make specialty crop production increasingly important to the county's future economy (fig. 15).

Supplemental irrigation is practiced on a few soils on the river bottoms. This irrigation is used on an as-needed basis, and selected areas are not irrigated in some years, but others are irrigated many times. Most irrigation is sprinkler type.

Figure 15.—A vineyard on Menfro silt loam, 5 to 9 percent slopes. Soils of the Haynie-Blake-Waldron association are in the background.

The latest information and suggestions for growing specialty crops can be obtained from the local offices of the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the

Cooperative Extension Service can provide information about the management and productivity of the soils.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*17*). Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

There are no class V or class VIII soils in St. Charles County.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

In class I there are no subclasses because the soils of this class have few limitations.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed soil map units."

woodland management and productivity

James L. Robinson, forester, Soil Conservation Service, assisted in the preparation of this section.

About three-fourths of St. Charles County was originally forested (*3*). Hardwoods, including oak, hickory, poplar, sycamore, ash, and walnut, were abundant and were harvested for buildings, barrels, fuel, and fences (*7*). As the land was cleared for farms, however, the forest dwindled. The 1950 census reported that forest land covered only about 15 percent of the county (*6*). According to the Forest Service Woodland Inventory (*18*), this figure was raised to 25 percent by 1972. The percentage has remained fairly stable since then, although some urbanized areas no longer produce commercial timber.

The Oak-Hickory forest is the major woodland cover type in St. Charles County. It occurs mainly on the Armster-Mexico-Hatton, Menfro-Harvester-Weller, and Goss-Crider-Gatewood associations of the general soil map. The soils in these associations generally have a moderate to moderately high production potential for timber, except the Mexico soil, which is a prairie soil. The primary species are white oak, northern red oak, and hickories. These stands are almost pure or in a mixture with black oak, scarlet oak, white or green ash, black walnut, winged elm, and maple. Black oak and scarlet oak are predominant on some sites. Eastern redcedar-hardwood forest is the major cover type growing on the Goss and Gasconade soils. Gasconade soil is a minor soil in the Goss-Crider-Gatewood association. Eastern redcedar, black oak, post oak, white oak, and hickories are the main components of the stand, which generally has a low production potential.

Crider, Menfro, and Holstein soils are well suited to the production of high quality black walnut. Aspect, or direction that the slope faces, is of major importance in determining production potential on strongly sloping to steep soils. The production on the north and east slopes is significantly higher than on slopes that face south and west.

The Portage-Carlow-Kampville and Haynie-Blake-Waldron associations contain the elm-ash-cottonwood forest types. Cottonwood grows in pure stands on islands and along the river or in stands mixed with black willow, silver maple, ash, and other moist bottom-land species. These soils generally have moderately high to very high production potential. Pecan trees are well suited to the somewhat poorly drained and poorly

drained soils in these associations. Black walnut is well suited to the well drained Haynie and Carr soils.

The Dockery-Haymond-Sensabaugh association has only minor amounts of timber mainly along small streams. Sycamore, ash, cottonwood, hackberry, black willow, silver maple, and pin oak are the common trees growing on the association. Haymond soils have very high production potential for black walnut.

The Lomax-Blase association does not have any forested areas of significance because of its high value for intensive cropping. These soils are, however, well suited to high value timber such as black walnut.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

windbreaks and environmental plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a nursery.

recreation

Edward A. Gaskins, biologist, Soil Conservation Service, assisted in the preparation of this section.

The Statewide Comprehensive Outdoor Recreation Plan (SCORP) shows a total of 43,639 acres of existing recreational developments in St. Charles County (*15*). The facilities include 527 acres of playfields; 11,774 acres of fishing waters; 8,241 acres of boating water; 2,354 acres of water suitable for sailboat or canoe use; 1,531,755 square feet of swimming area; 23,144 acres of hunting area; 184 acres of camping area; 9 miles of hiking trails; and 1,619 acres of picnicking areas. The same report projects a minimum county need to increase the miles of bike trails and horse paths and winter sports areas by the year 1990. These increases would meet the needs caused by a projected growth in the total county population (192,400) by that date (*4*).

There are no county or municipal parks larger than 100 acres. Several smaller parks are located throughout the county. Four state-owned or controlled areas exceed 100 acres and are available for use by the public. They are the Upper Mississippi Wildlife Area (11,311 acres), which includes facilities associated with Lock and Dam number 26, the Busch Wildlife Area (6,987 acres), the Howell Island Wildlife Area (2,575 acres), and the Marais Temps Clair, a wetland area (926 acres). One federal facility and six private commercial recreation areas are in the county. Each is more than 100 acres in size. Public access to the rivers is available at Dresser Island, West Alton, Howell Island, and Alton Dam. St. Charles County has about 157 miles of permanently flowing streams, which add to the recreational resource base.

The NACD Nationwide Outdoor Recreation Inventory lists 110 private and semi-private commercial recreation enterprises in operation in St. Charles County (*8*). They vary from fishing lakes, golf courses, riding stables, and historic sites to campgrounds, marinas, shooting preserves, and hunting clubs.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Edward A. Gaskins, biologist, Soil Conservation Service, assisted in the preparation of this section.

St. Charles is one of 21 counties that make up the Northeast Riverbreaks Zoogeographic Region in Missouri (*13*). The topography is primarily moderately sloping to strongly sloping with a band of nearly level bottom land along the Mississippi and Missouri Rivers. Between 1970 and 1980 the population increased from 92,954 to 143,659 and the demand for urban development of agricultural land increased. Wildlife habitat is being affected by the rapid changes in land use.

Approximately 25 percent of the county supports some form of woody vegetation, 56 percent is cultivated cropland, 14 percent is grassland, and 5 percent is urban land. In 1972, about 89,600 acres of the county was commercial forest land (*19*). The loss of habitat through changing land use is the major problem for the wildlife resource in St. Charles County.

In spite of this problem, the overall resource remains in a productive condition. A diversity of species is present, and some wildlife populations are increasing. Resident songbird populations are excellent. There has been a definite drop, however, in the number of bluebirds. With the exception of the opossum, furbearer numbers are rated as good. Because of recent attractive fur prices, there has been a significant increase in hunters and trappers in the county. A small population of badgers have become established, and there are a few bobcats in the southwest part of the county. Migratory bald eagles seasonally inhabit the Mississippi and Missouri River areas. Also, a few golden eagles are along the Missouri River. A good population of sora rails and a fair population of wilson's snipe are in the county.

The vast majority of the wildlife habitat in the county is controlled by the private landowner. Most of the hunters are county residents, and outsiders often have difficulty in obtaining permission to hunt on private land. The county is well supplied with state-owned wildlife areas which are open for public hunting: Upper Mississippi Wildlife Area, 11,311 acres; Busch Wildlife Area, 6,987 acres; Borrow Pit Area, 40 acres; Howell Island Area, 2,575 acres; Marais Temps Clair, a 926 acre wetland area; and the recently purchased Weldon Spring Tract, 8,000 acres.

Woodland areas are in all parts of the county. The Goss-Crider-Gatewood association in the southwest part of the county is 70 percent forested. Wooded riparian vegetation is abundant along the Mississippi and Missouri Rivers. Other smaller watercourses contain similar woodland vegetation.

The number of deer, turkey, and squirrel in the woodland areas is good. The deer herd is increasing slightly and may conflict with agricultural interests. In 1977, 440 deer were harvested in St. Charles County, giving it a ranking of 31st among the 114 counties in the state. The turkey population is increasing and filling available wildlife areas, which have not reached full carrying capacity. In 1977, 65 birds were taken, giving St. Charles a ranking of 47th of the 86 counties having a season. There is a good population of woodcock in the county, and most are in the southwest part of the county and along the Missouri River bottom. The number is increasing each year.

About 240,000 acres of the county is cropland and grassland which provides the habitat for openland wildlife. The Dockery-Haymond-Sensabaugh, Armster-Mexico-Hatton, Menfro-Harvester-Weller, and Lomax-Blase associations contain the most extensive areas.

Ninety-eight percent of the Lomax-Blase terrace association in the northeast part of the county is used for production of corn and soybeans. The Armster-Mexico-Hatton association offers the best mixture of cropland, grassland, and woodland. Grassland, however, is limited in all parts of the county, and each year numerous pastures are converted to cropland or urban development. The Menfro-Harvester-Weller soil association continues to have the most rapid urban expansion.

The quail population is rated as only fair in the county, and hunting appears to be decreasing. Rabbit numbers are good where ample cover exists. The resident dove population is considered to be good and is augmented by incoming migratory birds. A small but permanent population of pheasants is along the major river bottoms and is thought to be stable. Landowners in this area are very protective of the pheasants.

The primary waterfowl habitat in St. Charles County is in the Mississippi and Missouri River bottoms on the Portage-Carlow-Kampville (fig. 16) and Haynie-Blake-Waldron associations. Cropland makes up 75 to 90 percent of these associations. There are many private waterfowl developments—the duck clubs mostly in the Portage-Carlow-Kampville association along the Mississippi River. Large numbers of waterfowl use the association during spring and fall migrations, but there are fewer birds now than during the period 1950 to 1960. Natural habitat is decreasing as additional wetlands are lost through drainage. The Canada geese are growing in number, and the best increase is in the western part of the county. Wood ducks and a small number of mallards nest in places that furnish suitable habitat. The wooded river islands provide most of this habitat, and year-round water impoundments of private clubs furnish additional areas for nesting.

The Mississippi River borders St. Charles County for approximately 40 miles, and the Missouri River adds another 62 miles of river border to the county's fishery resource. Both rivers are commercially fished for carp, carpsucker, paddlefish, buffalo, sturgeon, drum, and flathead catfish. In addition to these, sport fishing yields bass, crappie, and walleye. Sloughs and backwater areas add largemouth and white bass, bluegill, crappie, warmouth, blue and channel catfish to the fisherman's

Figure 16.—Very poorly drained Portage clay soils are well suited to use as shallow water areas for waterfowl.

creel. The major rivers and streams that are at least moderately fished are the Cuivre River and the Peruque, Big Femme Osage, and Dardenne Creeks. Bass, crappie, sunfish, catfish, carp, drum, and suckers are found in these watercourses. The county has 157 miles of permanently flowing streams (*4*). Dresser Island, West Alton, Howell Island, and Alton Dam provide public fishing areas.

There are 32 lakes (499 acres of water) available for public fishing in the Busch Wildlife Area. Over 2,400 ponds and small lakes are privately owned. Several commercial recreation areas offer fee-fishing lakes as a part of their accommodations. The ponds and lakes are generally stocked with largemouth bass, channel catfish, and bluegill, either alone or in combination. Crappie are sometimes stocked in the larger impoundments. Though not open to the general public, the numerous small ponds and lakes do provide many fishing opportunities for the landowner, his family, and invited guests.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or

kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, barley, millet, soybeans, and milo.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are bluegrass, clover, switchgrass, orchardgrass, indiangrass, trefoil, and crownvetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, pokeweed, foxtail, croton, and partridgepea.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, wild plum, sumac, persimmon, and sassafras. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, crabapple, Amur honeysuckle, hawthorn, and hazelnut.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, cutgrass, cattail, rushes, sedges, and buttonbush.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, red fox, woodchuck, and mourning dove.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and

construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper

40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

sanitary facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover

for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 foot to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic

matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

engineering index properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*20*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Fluvent (*Flu*, meaning river, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Udifluvents (*Udi*, meaning humid, plus *fluvent*, the suborder of the Entisols that are on flood plains).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Udifluvents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is coarse silty, mixed, nonacid, mesic Typic Udifluvents.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*16*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*20*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Armster series

The Armster series consists of deep, moderately well drained, moderately slowly permeable soils on uplands. These soils formed in loess and glacial till. Slopes range from 5 to 9 percent.

Armster soils are similar to Keswick soils and are commonly adjacent to Keswick and Mexico soils. Keswick soils have a light-colored or thinner dark-colored surface layer than Armster soils and mottles with chroma of 2 or less in the upper part of the argillic horizon. Mexico soils have matrix colors with chroma of

2 or less, have less sand throughout the argillic horizon, and are on higher positions on the landscape.

Typical pedon of Armster silt loam, 5 to 9 percent slopes, about 700 feet south and 175 feet east of the southeast corner of Fitz cemetery in Busch Wildlife Area; UTM coordinates 696,220m E. and 4,287,240m N.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

A2—7 to 13 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct dark yellowish brown (10YR 3/4) and common medium faint grayish brown (10YR 5/2) mottles; weak fine prismatic structure parting to weak very fine; very friable; common fine roots; medium acid; abrupt smooth boundary.

B1—13 to 20 inches; brown (10YR 5/3) silt loam; common fine distinct brown (7.5YR 4/4) mottles; moderate very fine subangular blocky structure; friable; common fine roots; strongly acid; clear smooth boundary.

IIB21t—20 to 30 inches; brown (7.5YR 4/4) clay; common fine prominent yellowish red (5YR 5/6) and common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate very fine subangular blocky structure; thin continuous clay films on faces of peds; firm; few fine roots; very strongly acid; clear smooth boundary.

IIB22t—30 to 48 inches; yellowish brown (10YR 5/6) clay; common fine distinct brown (10YR 5/3), common fine prominent yellowish red (5YR 5/6), and few fine prominent grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to weak very fine subangular blocky; firm; few fine roots; thin continuous clay films on prism faces and common black stains; strongly acid; abrupt smooth boundary.

IIC—48 to 63 inches; grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) clay; massive; firm; common sand grains; few rounded glacial pebbles and few angular chert fragments; medium acid.

The thickness of the solum is typically 40 to about 60 inches.

The Ap horizon has hue of 10YR, value of 2, 3, or 4, and chroma of 2 or 3. Texture typically is silt loam, but the range includes loam. The Ap horizon ranges in thickness from 6 to 10 inches. The A2 horizon is loam or silt loam. The IIB2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture is clay loam or clay. Reaction of the B horizon ranges from medium acid to very strongly acid.

Auxvasse series

The Auxvasse series consists of deep, poorly drained, very slowly permeable soils on stream terraces. They formed in loess and silty alluvium. Slopes range from 0 to 2 percent.

Auxvasse soils are similar to Marion soils and are commonly adjacent to Dockery and Westerville soils. Marion soils are not as gray as the Auxvasse soils in the argillic horizon. Dockery soils have less clay and are on flood plains. Westerville soils also have less clay and are slightly lower on the landscape.

Typical pedon of Auxvasse silt loam, 1,775 feet north and 250 feet west of the southeast corner of section 29, T. 47 N., R. 1 E.; UTM coordinates 680,150m E. and 4,296,540m N.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate very fine granular structure; very friable; many roots; medium acid; abrupt smooth boundary.

A&B—8 to 13 inches; pale brown (10YR 6/3) silt loam (A2), and strong brown (7.5YR 5/6) silty clay (B2); few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate very fine subangular blocky structure; friable; few fine black concretions; slightly acid; abrupt smooth boundary.

B21tg—13 to 22 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) silty clay; weak fine prismatic structure parting to moderate very fine subangular blocky; firm; few thin clay films; strongly acid; gradual smooth boundary.

B22tg—22 to 29 inches; mottled grayish brown (10YR 5/2), brown (10YR 5/3), and yellowish brown (10YR 5/6) silty clay; moderate fine prismatic structure; firm; few thin clay films on faces of peds; very strongly acid; clear smooth boundary.

B3g—29 to 40 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; firm; very strongly acid; clear smooth boundary.

Cg—40 to 60 inches; coarsely mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) silty clay loam; massive; friable; strongly acid.

The thickness of the solum ranges from 30 to 41 inches or more.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The B2t horizon averages between 45 and 60 percent clay. It has hue of 10YR, value of 4 or 5, and chroma of 2. There are common mottles with value of 4 or 5 and chroma of 3 to 6 in hue of 10YR.

Blake series

The Blake series consists of deep, somewhat poorly drained, moderately permeable soils. These soils are on

the Missouri River flood plain. They formed in silty and loamy alluvium. Slopes range from 0 to 2 percent.

Blake soils are similar to Haynie soils and are commonly adjacent to Booker, Haynie, and Waldron soils. Booker soils are more than 60 percent clay and are on lower positions on the landscape than Blake soils. Haynie soils have more sand throughout. Waldron soils are clayey throughout and are also lower.

Typical pedon of Blake silty clay loam, 850 feet north and 50 feet east of the southwest corner of section 16, T. 44 N., R. 1 E.; UTM coordinates 680,480m E. and 4,270,140m N.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

C1—8 to 25 inches; dark grayish brown (10YR 4/2) silty clay loam with thin strata of silty clay; few fine faint (10YR 4/4) mottles; moderate very fine subangular blocky structure; firm; few fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.

C2—25 to 47 inches; dark grayish brown (10YR 4/2) very fine sandy loam with strata of silty clay; few fine faint dark gray (10YR 4/1) mottles; massive; very friable; few fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

C3—47 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; massive; firm; slight effervescence; moderately alkaline.

The thickness of the solum is less than 10 inches and corresponds to the thickness of the A1 or Ap horizon. The depth to horizons that are less clayey than silty clay loam is generally 18 to 35 inches.

The A horizon has hue of 10YR, value of 3, and chroma of 1 or 2. Texture typically is silty clay loam, but the range includes silt loam. The IIC horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2) silt loam or very fine sandy loam with coarser and finer strata.

Blase series

The Blase series consists of deep, somewhat poorly drained soils that are slowly permeable in the upper part and moderately permeable in the lower part. They formed in 18 to 38 inches of fine-textured alluvium over medium textured alluvial materials. Slopes range from 0 to 2 percent.

Blase soils are commonly adjacent to Lomax and Portage soils. Lomax soils are sandy throughout and are on the highest part of the terrace. Portage soils are clayey throughout and are on the adjacent flood plains.

Typical pedon of Blase silty clay loam, about 1,425 feet east and 2,500 feet north of the southwest corner of section 22, T. 48 N., R. 5 E.; UTM coordinates 721,220m E. and 4,309,100m N.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

A12—10 to 17 inches; very dark gray (10YR 3/1) silty clay, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; firm; common thin brown (10YR 5/3) coatings on faces of peds; medium acid; clear smooth boundary.

B2—17 to 32 inches; grayish brown (10YR 5/2) silty clay; few fine distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; firm; medium acid; abrupt smooth boundary.

IIC1—32 to 48 inches; brown (10YR 5/3) loam; massive; very friable; neutral; clear smooth boundary.

IIC2—48 to 60 inches; brown (10YR 5/3) very fine sandy loam; massive; very friable; mildly alkaline.

The thickness of the solum ranges from 18 to 38 inches and is the same as the thickness of the clayey upper part of the soil. The mollic epipedon ranges from 10 to about 22 inches in thickness.

The Ap horizon is most commonly silty clay loam, but the range includes silty clay. The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction is typically medium acid to neutral. The B2 horizon has hue of 10YR, value of 3 to 5, and chroma of 2 with the darker colors in the upper part. Reaction is medium acid to slightly acid. The IIC horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is loam, silt loam, or very fine sandy loam. Reaction is neutral to mildly alkaline.

Booker series

The Booker series consists of deep, very poorly drained, very slowly permeable soils on the Missouri River flood plain. They formed in thick clayey alluvium. Slopes range from 0 to 2 percent.

Booker soils are similar to Portage soils and are commonly adjacent to Blake and Waldron soils. Blake soils have less clay than Booker soils and are on higher positions on the landscape. Portage soils are acid. Waldron soils have less clay, are not as gray, and are slightly higher.

Typical pedon of Booker clay, 150 feet south and 3,100 feet west of the northeast corner of section 12, T. 47 N., R. 5 E.; UTM coordinates 724,670m E. and 4,303,300m N.

Ap—0 to 12 inches; very dark gray (10YR 3/1) clay, dark gray (10YR 4/1) dry; few fine prominent dark red (2.5YR 3/6) mottles; moderate fine subangular blocky structure; firm; common roots; neutral; clear smooth boundary.

B1g—12 to 26 inches; very dark gray (10YR 3/1) clay; few fine prominent dark red (2.5YR 3/6) mottles; moderate fine subangular blocky structure; firm; few roots; neutral; clear smooth boundary.

B2g—26 to 37 inches; dark gray (5Y 4/1) clay; common fine prominent dark red (2.5YR 3/6) mottles; moderate fine subangular blocky structure; firm; few roots; neutral; clear smooth boundary.

Cg—37 to 60 inches; dark gray (10YR 4/1) clay; few fine prominent yellowish red (5YR 4/6) mottles; massive; firm; neutral.

The thickness of the solum ranges from 30 to 48 inches. Reaction ranges from medium acid to neutral throughout.

The A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. Texture typically is clay, but the range includes silty clay. The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 2 to 5, and chroma of 0 to 2. Matrix colors of the C horizon have hue of 2.5Y, 5Y, or 10YR, value of 4 or 5, and chroma of 2 or less.

Carlow series

The Carlow series consists of deep, poorly drained, very slowly permeable soils on the Mississippi River flood plain. They formed in clayey alluvium. Slopes range from 0 to 2 percent.

Carlow soils are commonly adjacent to Chequest, Hurst, Kampville, and Portage soils. Chequest soils have less clay and are on slightly higher positions on the landscape. Hurst soils do not have a mollic epipedon and are on low terraces. Kampville soils have less clay, do not have a mollic epipedon, and are on similar landscape positions. Portage soils are more than 60 percent clay and are slightly lower.

Typical pedon of Carlow silty clay loam, 2,575 feet west and 50 feet south of the northeast corner of section 8, T. 47 N., R. 4 E.; UTM coordinates 708,980m E. and 4,303,090m N.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine granular structure; firm; common fine roots; medium acid; abrupt smooth boundary.

A12—8 to 14 inches; very dark grayish brown (10YR 3/2) silty clay, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; firm; few fine roots; strongly acid; clear smooth boundary.

B21g—14 to 23 inches; dark gray (10YR 4/1) silty clay; few fine prominent yellowish red (5YR 4/6) mottles; weak very fine subangular blocky structure; firm; very strongly acid; clear smooth boundary.

B22g—23 to 40 inches; dark gray (10YR 4/1) silty clay; common fine prominent yellowish red (5YR 4/6) mottles; weak very fine subangular blocky structure; firm; strongly acid; clear smooth boundary.

Cg—40 to 60 inches; dark gray (10YR 4/1) silty clay; common fine prominent strong brown (7.5YR 5/6) mottles; massive; firm; strongly acid.

Thickness of the solum ranges from 30 to about 60 inches. The mollic epipedon is 10 to 20 inches thick. The control section is typically silty clay and averages 48 to 60 percent clay. Reaction ranges from medium acid to very strongly acid.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or less. It is typically silty clay loam. Some pedons are silty clay. The B and C horizons have hue of 10YR, value of 4 to 6, and chroma of 2 or less with bright-colored mottles.

Carr series

The Carr series consists of deep, well drained, moderately rapidly permeable soils on the Missouri River flood plain. They formed in sandy and loamy alluvium. Slopes are less than 2 percent.

Carr soils are commonly adjacent to Haynie and Hodge soils. Haynie soils have less sand and are on slightly lower positions on the landscape. Hodge soils have more sand throughout and are slightly higher.

Typical pedon of Carr fine sandy loam, 1,850 feet south and 900 feet west of the northeast corner of section 21, T. 44 N., R. 1 E.; UTM coordinates 681,420m E. and 4,269,340m N.

Ap—0 to 15 inches; dark grayish brown (10YR 4/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; few roots; slight effervescence; moderately alkaline; clear smooth boundary.

C1—15 to 34 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak medium granular structure; very friable; few roots; slight effervescence; moderately alkaline; abrupt smooth boundary.

IIC2—34 to 60 inches; pale brown (10YR 6/3) fine sand; single grain; loose; slight effervescence; moderately alkaline.

The depth of the solum ranges from 6 to 15 inches and corresponds to the thickness of the A horizon. The soil is mildly alkaline or moderately alkaline throughout.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 3. Texture is typically fine sandy loam and ranges from loamy fine sand to loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3. Texture is typically fine sandy loam and contains thin strata of coarser or finer material. The IIC horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It is typically loamy sand or fine sand with thin strata of coarser or finer material.

Cedargap series

The Cedargap series consists of deep, somewhat excessively drained, moderately rapidly permeable soils on small stream flood plains. They formed in recent alluvium formed largely from nearby upland soils underlain by cherty dolomite and sandstone. Slopes range from 0 to 2 percent.

Cedargap soils are commonly adjacent to Haymond and Sensabaugh soils. Haymond soils do not contain chert. Sensabaugh soils generally do not have chert in the upper 20 to 40 inches. Both soils are on landscape positions similar to that of the Cedargap soils.

Typical pedon of Cedargap silt loam, 600 feet north and 950 feet east of the center of section 16, T. 45 N., R. 1 E.; UTM coordinates 681,510m E. and 4,280,710m N.

A11—0 to 5 inches; dark brown (7.5YR 3/2) silt loam, brown (7.5YR 5/3) dry; weak fine granular structure; very friable; many fine roots; estimated 10 percent chert fragments; neutral; abrupt wavy boundary.

A12—5 to 35 inches; dark brown (7.5YR 3/2) very cherty loam, brown (10YR 5/3) dry; weak very fine granular structure; very friable; few roots; estimated 75 percent chert fragments; neutral: clear wavy boundary.

C—35 to 60 inches; brown (7.5YR 4/2) very cherty loam; weak very fine subangular blocky structure; firm; few roots; estimated 75 percent chert fragments; neutral.

The thickness of the solum is less than 36 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. It generally is silt loam in the upper part, but the range includes cherty silt loam; and it is very cherty loam or very cherty silt loam in the lower part. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. Texture is cherty or very cherty loam or silt loam.

Chequest series

The Chequest series consists of deep, poorly drained, moderately slowly permeable soils on the Mississippi River bottoms. They formed in acid, silty and clayey alluvium. Slopes range from 0 to 2 percent.

These soils have a silt loam Ap horizon and are less gray in the subsoil than is defined as the range for the Chequest series, but this difference does not significantly affect the use or behavior of the soil.

Chequest soils are similar to Edinburg soils and are commonly adjacent to Carlow, Hurst, and Kampville soils. Carlow soils have a higher clay content than Chequest soils and are on slightly lower positions on the landscape. Edinburg soils have an argillic horizon and formed in loess. Hurst soils do not have a mollic epipedon and are on low terraces. Kampville soils have less clay, do not have a mollic epipedon, and are slightly lower.

Typical pedon of Chequest silt loam, about 1,450 feet east and 775 feet south of the northwest corner of section 36, T. 48 N., R. 3 E.; UTM coordinates 705,240m E. and 4,306,130m N.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; friable; few fine roots; medium acid; clear smooth boundary.

A12—10 to 20 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; few fine roots; thin silt coatings on faces of peds; medium acid; abrupt smooth boundary.

B2g—20 to 40 inches; dark grayish brown (10YR 4/2) silty clay; few fine distinct gray (10YR 5/1) and common fine prominent brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin patchy clay films; strongly acid; abrupt smooth boundary.

B3g—40 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine prominent brown (7.5YR 4/4) mottles; weak fine subangular blocky structure; firm; thin silt coatings on faces of peds; strongly acid.

The thickness of the solum is typically more than 60 inches. Thickness of the mollic epipedon ranges from 10 to 20 inches.

The Ap horizon is generally silt loam, but the range includes silty clay loam. The A horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The Bg horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or less. Reaction ranges from medium acid to strongly acid.

Crider series

The Crider series consists of deep, well drained, moderately permeable soils on uplands. They formed in loess and the underlying materials weathered from limestone. Slopes range from 5 to 20 percent.

Crider soils are similar to Menfro and Winfield soils and are commonly adjacent to Gatewood, Goss, Keswick, and Winfield soils. Gatewood soils are not as red as Crider soils and are moderately deep to bedrock. Goss soils are cherty throughout and are on lower positions on the landscape. Keswick soils have more clay, sand, and pebbles and are also lower. Menfro and Winfield soils do not have a red IIB2 horizon. Also, Winfield soils have mottles in chroma of 2 in the lower part of the B horizon.

Typical pedon of Crider silt loam, 9 to 14 percent slopes, eroded, 2,200 feet south and 300 feet east of the northwest corner of section 22, T. 45 N., R. 1 E.; UTM coordinates 682,170m E. and 4,279,040m N.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, yellowish brown (10YR 5/4) dry; weak very fine subangular blocky structure; friable; many fine roots; neutral; abrupt smooth boundary.

B21t—8 to 16 inches; strong brown (7.5YR 4/6) silty clay loam; few fine prominent red (2.5YR 4/8) and common fine prominent pale brown (10YR 6/3) mottles; moderate very fine subangular blocky structure; firm; common fine roots; few black stains; thin continuous clay films; strongly acid; clear smooth boundary.

B22t—16 to 23 inches; brown (7.5YR 4/4) and dark yellowish brown (10YR 4/4) silty clay loam; common medium prominent strong brown (7.5YR 5/8) mottles; moderate very fine subangular blocky structure; firm; common roots; common black stains; thin continuous clay films; strongly acid; clear smooth boundary.

IIB23t—23 to 30 inches; yellowish red (5YR 4/6) silty clay loam; common fine prominent dark brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; firm; few roots; common black stains; thin continuous clay films; estimated 5 to 10 percent chert fragments; slightly acid; gradual smooth boundary.

IIB24t—30 to 60 inches; red (2.5YR 4/6) silty clay loam; common fine prominent brown (7.5YR 4/4) mottles; moderate very fine subangular blocky structure; firm; thin continuous clay films; estimated 5 percent chert fragments; few black stains; medium acid.

Thickness of the solum or depth to bedrock is more than 60 inches. Chert fragments range from 0 to 15 percent below the lithologic discontinuity 20 to 45 inches from the surface.

The Ap horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 3 or 4. The B horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is silt loam or silty clay loam. Reaction ranges from slightly to strongly acid. The IIB horizon has hue of 2.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. Texture is silty clay loam and, less commonly, silty clay. Reaction ranges from medium acid to strongly acid. The upper 20 inches of the argillic horizon averages between 28 and 35 percent clay.

Dockery series

The Dockery series consists of deep, somewhat poorly drained, moderately permeable soils on bottom lands. They formed in medium textured alluvium. Slopes range from 0 to 2 percent.

Dockery soils are similar to Haymond soils and are commonly adjacent to Haymond and Kennebec soils. Haymond soils do not have mottles in chroma of 2. Kennebec soils have a mollic epipedon and are similar in landscape positions to Dockery soils.

Typical pedon of Dockery silt loam, about 275 feet south of the junction of Weiss Road and Highway N.; UTM coordinates 703,890m E. and 4,291,840m N.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; very friable; medium acid; clear smooth boundary.

C1—9 to 29 inches; brown (10YR 4/3) silt loam; common fine faint grayish brown (10YR 4/2) mottles; massive; very friable; slightly acid; clear smooth boundary.

C2—29 to 60 inches; grayish brown (10YR 5/2) silt loam; few fine distinct brown (7.5YR 5/4) mottles; massive; very friable; common black concretions; neutral.

The thickness of the solum ranges from 4 to 10 inches and corresponds to the thickness of the A horizon.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The C horizon typically has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Common to many, faint to distinct mottles in chroma of 2 are within a depth of 20 inches.

Dupo series

The Dupo series consists of deep, somewhat poorly drained, slowly permeable soils on flood plains. They formed in 20 to 40 inches of recent light-colored silty alluvium underlain by an older, dark-colored buried soil. Slopes range from 0 to 2 percent.

Dupo soils are commonly adjacent to Dockery and Portage soils. Dockery soils have silty textures throughout and are generally nearer to the uplands than Dupo soils. Portage soils are clayey throughout and are farther away from the uplands.

Typical pedon of Dupo silt loam, 150 feet west and 1,100 feet south of the northeast corner of section 22, T. 47 N., R. 4 E.; UTM coordinates 712,760m E. and 4,299,460m N.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak very fine granular structure; very friable; medium acid; clear smooth boundary.

C—10 to 20 inches; dark brown (10YR 4/3) silt loam; few medium distinct brown (7.5YR 4/4) and few fine faint dark grayish brown (10YR 4/2) mottles; weak thin platy structure; very friable; slightly acid; abrupt smooth boundary.

IIAb1—20 to 24 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak fine subangular blocky structure; firm; slightly acid; abrupt smooth boundary.

IIAb2—24 to 36 inches; very dark gray (10YR 3/1) silty clay; weak fine subangular blocky structure; firm; slightly acid; clear smooth boundary.

IIC—36 to 60 inches; dark gray (10YR 4/1) clay; weak fine subangular blocky structure; firm; slightly acid.

Depth to the dark-colored IIAb horizon ranges from 20 to 40 inches. The 10- to 40-inch control section ranges from medium acid to neutral.

The Ap horizon is generally dark brown (10YR 4/3) or dark grayish brown (10YR 4/2). The C horizon is generally brown (10YR 4/3, 5/3) or dark grayish brown (10YR 4/2). The texture is silt loam that averages slightly less than 18 percent clay. The Ab horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam, silty clay, or clay. The IIC horizon is dark gray (10YR 4/1) or gray (10YR 5/1) clay or silty clay.

Edinburg series

The Edinburg series consists of deep, poorly drained, slowly permeable soils on high terraces. They formed in loess. Slopes range from 0 to 1 percent.

Edinburg soils are similar to Chequest soils and are commonly adjacent to Herrick and Weller soils. Chequest soils do not have an argillic horizon and formed in alluvium. Weller soils do not have a mollic epipedon and are also higher than Edinburg soils on the landscape.

Typical pedon of Edinburg silty clay loam, about 30 feet west of a private drive, 1,650 feet south of Flatwoods Road; UTM coordinates 693,640m E. and 4,308,900m N.

Ap—0 to 4 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; few fine roots; neutral; abrupt smooth boundary.

A12—4 to 11 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; few fine roots; neutral; clear smooth boundary.

A13—11 to 20 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; few fine roots; slightly acid; gradual smooth boundary.

B2t—20 to 31 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine prominent light olive brown (2.5Y 5/4) mottles; moderate very fine subangular blocky structure; firm; thick discontinuous clay films on faces of peds; very dark grayish brown (10YR 3/2) organic coatings on surface of peds; medium acid; clear smooth boundary.

B3t—31 to 44 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct light yellowish brown (2.5Y 6/4) mottles; weak very fine subangular blocky structure; firm; thin patchy clay films in pores and on faces of peds; slightly acid; clear smooth boundary.

C—44 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common fine prominent brownish yellow (10YR 6/6) mottles; massive; firm; thin patchy dark yellowish brown (10YR 4/2) clay films in root channels; neutral.

The thickness of the solum ranges from 40 to about 60 inches. The mollic epipedon ranges from 12 to 24 inches in thickness.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Texture is silt loam or silty clay loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or less with mottles of higher chroma. Texture is silty clay or silty clay loam. The upper 20 inches of the horizon averages from 36 to 46 percent clay. Reaction ranges from medium acid to neutral. The C horizon is neutral to mildly alkaline.

Freeburg series

The Freeburg series consists of deep, somewhat poorly drained, moderately slowly permeable soils on terraces. They formed in alluvial sediments washed from loess and residual soils of the nearby uplands. Slopes range from 0 to 2 percent.

Freeburg soils are similar to Weller soils and are commonly adjacent to Menfro and Sensabaugh soils. Menfro and Winfield soils are on uplands. In addition, Menfro soils do not have mottles in chroma of 2, and Weller soils have more clay in the subsoil than Freeburg soils. Sensabaugh soils have more sand, do not have mottles in chroma of 2, and are on stream bottoms.

Typical pedon of Freeburg silt loam, 2,900 feet north and 1,500 feet east of the southwest corner of Spanish survey 303, T. 45 N., R. 2 E.; UTM coordinates 691,630m E. and 4,279,140m N.

Ap—0 to 10 inches; brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; weak very fine granular structure; very friable; many roots; neutral; abrupt smooth boundary.

B1t—10 to 19 inches; brown (7.5YR 5/4) silty clay loam; common medium distinct pinkish gray (7.5YR 6/2) mottles; weak fine subangular blocky structure; very friable; common fine roots; thin clay films in root channels; few black stains; slightly acid; clear smooth boundary.

B21t—19 to 28 inches; brown (7.5YR 5/4) silty clay loam; many medium distinct pinkish gray (7.5YR 6/2) mottles; weak fine subangular blocky structure; friable; few fine roots; common black stains; thin clay films in root channels; strongly acid; clear smooth boundary.

B22t—28 to 41 inches; brown (7.5YR 5/4) silty clay loam; common medium distinct pinkish gray (7.5YR 6/2) and common fine distinct strong brown (7.5YR 5/8) mottles; moderate fine subangular blocky structure; friable; few fine roots; common black stains and concretions; thin clay films in root channels; very strongly acid; clear smooth boundary.

B3t—41 to 60 inches; brown (7.5YR 5/4) silty clay loam; common medium distinct pinkish gray (7.5YR 6/2) and common fine distinct strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; friable; thin patchy clay films on faces of peds and in root channels; common black stains; strongly acid.

The thickness of the solum ranges from 33 to 60 inches or more.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In some pedons there is a lighter colored A2 horizon. Reaction is slightly acid or neutral. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6, with mottles of low chroma. It is medium to strongly acid in the upper part and strongly acid to very strongly acid in the lower part. The upper 20 inches of the control section averages between 27 and 35 percent clay and is less than 15 percent fine sand or coarser.

Gasconade series

The Gasconade series consists of shallow, somewhat excessively drained, moderately slowly permeable soils on uplands. They formed in residuum weathered from limestone. Slopes range from 15 to 50 percent.

Gasconade soils are commonly adjacent to Gatewood and Goss soils. Gatewood soils have more clay, are deeper to limestone bedrock, do not have coarse fragments, and are generally higher than Gasconade soils. Goss soils are cherty throughout, are more than 60 inches deep, and are on the upper side slopes.

Typical pedon of Gasconade silty clay loam, from an area of Gasconade-Rock outcrop complex, 15 to 50 percent slopes, 1,100 feet north and 1,800 feet east of the southwest corner of section 5, T. 45 N., R. 2 E.; UTM coordinates 688,830m E. and 4,283,410m N.

A1—0 to 4 inches; very dark gray (10YR 3/1) silty clay loam, very dark grayish brown (10YR 3/2) dry; strong very fine subangular blocky structure; firm; common roots; estimated less than 10 percent coarse fragments; neutral; clear smooth boundary.

B2—4 to 15 inches; dark brown (7.5YR 3/2) cherty silty clay loam; moderate very fine subangular blocky structure; firm; few roots; estimated 40 percent coarse fragments; neutral; abrupt wavy boundary.

R—15 inches; limestone.

The thickness of the solum ranges from 9 to 20 inches and corresponds to the depth to bedrock. The content of coarse fragments ranges from 35 to 60 percent. Reaction of the solum ranges from slightly acid to mildly alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Texture generally is silty clay loam, but the range includes cherty silty clay loam. The B horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 to 4. Texture is cherty or very cherty silty clay loam.

Gatewood series

The Gatewood series consists of moderately deep, well drained, slowly permeable soils on relatively smooth upland side slopes. They formed in material weathered from interbedded limestone and shale. Slopes range from 15 to 50 percent.

These soils are better drained and less acid throughout than is defined as the range for the Gatewood series, but these differences do not significantly alter the use or behavior of the soils.

Gatewood soils are commonly adjacent to Crider, Gasconade, and Goss soils. Crider soils are redder than Gatewood soils, are more than 60 inches deep to bedrock, and are on higher positions on the landscape. Gasconade soils are less than 20 inches to limestone bedrock, have coarse fragments, and are generally lower than Gatewood soils. Goss soils are deep and cherty throughout and are higher than Gatewood soils.

Typical pedon of Gatewood silt loam, from an area of Gatewood-Gasconade-Crider complex, 15 to 50 percent slopes, about 2,200 feet north and 725 feet west of the southeast corner of section 5, T. 44 N., R. 2 E.; UTM coordinates 689,720m E. and 4,273,850m N.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; many fine roots; few limestone fragments; neutral; abrupt smooth boundary.

B21t—2 to 7 inches; brown (7.5YR 4/4) silty clay; moderate fine subangular blocky structure; firm; few fine roots; few chert fragments; neutral; clear smooth boundary.

B22t—7 to 24 inches; strong brown (7.5YR 4/6) clay; moderate fine subangular blocky structure; firm; few fine roots; few chert fragments; neutral.

R—24 inches; limestone bedrock.

The thickness of the solum ranges from 15 to 25 inches. Depth to hard bedrock ranges from 20 to 40 inches. Content of limestone and chert fragments ranges from 0 to 15 percent. Reaction ranges from neutral to mildly alkaline throughout the solum.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. It is generally silt loam, but the range includes silty clay loam. The B horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. Texture is clay or silty clay.

Goss series

The Goss series consists of deep, well drained, moderately permeable cherty soils on uplands. They

formed in materials weathered from cherty dolomite and interbedded shale. Slopes range from 5 to 35 percent.

Goss soils are commonly adjacent to Crider, Holstein, Gasconade, and Keswick soils. Crider soils contain less than 15 percent chert and are lower than Goss soils on the landscape. Gasconade soils are less than 20 inches to bedrock and are also lower than Goss soils. Holstein soils have less chert and are lower. Keswick soils do not have chert and are higher.

Typical pedon of Goss cherty silt loam, 14 to 35 percent slopes, 800 feet north and 1,200 feet west of the southeast corner of section 19, T. 45 N., R. 1 E.; UTM coordinates 678,480m E. and 4,278,200m N.

A1—0 to 3 inches; brown (10YR 4/3) cherty silt loam, light gray (10YR 7/2) dry; moderate very fine granular structure; very friable; many roots; estimated 15 percent chert fragments; strongly acid; clear smooth boundary.

A2—3 to 9 inches; yellowish brown (10YR 5/4) cherty silt loam; moderate very fine granular structure; very friable; many roots; estimated 20 percent chert fragments; very strongly acid; clear smooth boundary.

B1—9 to 16 inches; strong brown (7.5YR 5/6) cherty silt loam; moderate very fine subangular blocky structure; friable; common roots; estimated 40 percent chert fragments; very strongly acid; clear smooth boundary.

B21t—16 to 28 inches; yellowish red (5YR 5/6) cherty silty clay; common fine prominent brown (7.5YR 5/4) mottles; moderate very fine subangular blocky structure; firm; few roots; estimated 45 percent chert fragments; very strongly acid; clear wavy boundary.

B22t—28 to 44 inches; red (2.5YR 5/6) very cherty silty clay; common fine prominent yellowish brown (10YR 5/4) mottles; moderate very fine subangular blocky structure; firm; few roots; estimated 55 percent chert fragments; very strongly acid; clear wavy boundary.

B23t—44 to 60 inches; strong brown (7.5YR 5/6) very cherty silty clay; common medium prominent pale brown (10YR 6/3) mottles; weak very fine subangular blocky structure; firm; estimated 80 percent chert fragments; very strongly acid.

The thickness of the solum is 60 inches or more. Depth to bedrock is more than 60 inches.

The A1 horizon has color value of 3 or 4 and chroma of 2 to 4. The A2 horizon has value of 5 or 6 and chroma of 3 or 4. The B2 horizon has hue of 2.5YR to 7.5YR, value of 4 or 5, and chroma of 4 to 6. The chert content of the A horizon ranges from about 10 percent to about 50 percent. The chert content of the B horizon ranges from about 40 percent to about 90 percent.

Harvester series

The Harvester series consists of deep, moderately well drained, moderately slowly permeable soils on uplands. They formed in materials transported by earthmoving equipment and in an older underlying truncated soil. Slopes range from 2 to 14 percent.

Harvester soils are similar to Menfro and Winfield soils and are commonly adjacent to them. Menfro and Winfield soils have not been truncated and rearranged and have argillic horizons.

Typical pedon of Harvester silt loam, from an area of Harvester-Urban land complex, 2 to 9 percent slopes, in Spanish survey 979, 190 feet north and 360 feet east of the northwest corner of section 34, T. 47 N., R. 4 E.; UTM coordinates 711,320m E. and 4,296,240m N.

A1—0 to 2 inches; brown (10YR 4/3) silt loam; common coarse distinct very dark grayish brown (10YR 3/2) mottles; few pockets of dark brown (7.5YR 4/4) silty clay loam; moderate very fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

C1—2 to 7 inches; dark yellowish brown (10YR 4/4) silt loam; common pockets of dark brown (7.5YR 4/4) silty clay loam; weak medium platy fragments; friable; many fine roots; neutral; clear smooth boundary.

C2—7 to 13 inches; dark brown (7.5YR 4/4) silty clay loam; few fine pockets and thin discontinuous lenses of brown (10YR 4/3) silt loam; strong medium platy fragments; firm; common fine roots; medium acid; abrupt smooth boundary.

C3—13 to 15 inches; dark brown (10YR 4/3) silt loam; few pockets of brown (7.5YR 4/4) silty clay loam; moderate medium platy fragments; firm; common fine roots; slightly acid; abrupt smooth boundary.

C4—15 to 21 inches; brown (7.5YR 4/4) silty clay loam; few thin discontinuous lenses of brown (10YR 4/3) silt loam; strong coarse blocky fragments; very firm; common fine roots flattened along faces of fragments; common black (10YR 2/1) stains; neutral; abrupt smooth boundary.

C5—21 to 31 inches; dark grayish brown (10YR 4/2) silt loam; common fine pockets of brown to dark brown (7.5YR 4/4) silty clay loam; moderate medium platy fragments; firm; common reddish brown (5YR 4/4) stains along cleavage planes; common partly decomposed organic material; neutral; abrupt smooth boundary.

B2b—31 to 47 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium prismatic structure; very firm; few fine black (10YR 2/1) concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

B3b—47 to 67 inches; brown (7.5YR 4/4) silty clay loam; weak medium prismatic structure; firm; few fine

black (10YR 2/1) concretions and stains (iron and manganese oxides); slightly acid.

The solum is less than 6 inches thick and corresponds to the A1 horizon. Depth to bedrock is 60 inches or more. Texture is silt loam or silty clay loam in all horizons. Depth to undisturbed soil materials ranges from 20 to 40 inches.

Hatton series

The Hatton series consists of deep, moderately well drained, very slowly permeable soils on uplands. They formed in loess and the underlying glacial sediments. Slopes range from 5 to 9 percent.

Hatton soils are similar to Lindley and Keswick soils and are commonly adjacent to Marion, Mexico, and Keswick soils. Lindley soils have glacial sand and pebbles throughout. Marion soils have mottles in chroma of 2 in the upper part of the B horizon, do not have glacial sand and pebbles in the lower part, and are on higher positions on broad ridges than Hatton soils. Mexico soils have a dark-colored surface layer, more clay, and are higher on the landscape. Keswick soils have more glacial sand and pebbles and more clay.

Typical pedon of Hatton silt loam, 5 to 9 percent slopes, 450 feet south and 550 feet west of the northeast corner of the SE 1/4 of section 8, T. 47 N., R. 1 E.; UTM coordinates 680,000m E. and 4,301,530m N.

Ap—0 to 5 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak very thin platy structure parting to moderate very fine granular; very friable; many fine roots; neutral; abrupt smooth boundary.

A2—5 to 10 inches; brown (10YR 5/3) silt loam; moderate very fine granular structure; friable; common fine roots; neutral; clear smooth boundary.

B1—10 to 15 inches; yellowish brown (10YR 5/4) silt loam; moderate very fine subangular blocky structure; firm; common fine roots; strongly acid; abrupt smooth boundary.

B21t—15 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; strong fine subangular blocky structure; firm; common fine roots; many silt coatings; very strongly acid; abrupt smooth boundary.

B22t—20 to 29 inches; dark brown (7.5YR 4/4) silty clay loam; few fine faint strong brown (7.5YR 5/6) and few fine distinct reddish brown (5YR 4/4) mottles; moderate very fine prismatic structure parting to moderate very fine subangular blocky; firm; few fine roots; light brownish gray (10YR 6/2) silt coatings on surfaces of peds; very strongly acid; clear smooth boundary.

B3—29 to 38 inches; strong brown (7.5YR 4/4) silty clay loam; common fine distinct brown (10YR 5/3) and common fine distinct yellowish red (5YR 5/6) mottles; weak very fine subangular blocky structure; firm; very strongly acid; clear smooth boundary.

IIC1x—38 to 54 inches; strong brown (7.5YR 4/6) clay loam; common fine prominent pale brown (10YR 6/3) mottles; massive; weakly brittle, very firm; few clay films in pores and few black stains; strongly acid; clear smooth boundary.

IIC2—54 to 67 inches; yellowish red (5YR 5/6) clay loam; common fine faint yellowish red (5YR 4/6) mottles; massive; very firm, friable; common clay pockets, few coarse fragments, few black stains and few large sand grains; medium acid.

The thickness of the solum ranges from 30 to more than 60 inches. Depth to weathered glacial till ranges from 27 to 38 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 or 6. Some pedons have red mottles. Texture is silty clay loam or silty clay, and the upper 20 inches of the argillic horizon averages between 35 and 48 percent clay. The IIC horizon is clay loam or silty clay loam.

Haymond series

The Haymond series consists of deep, well drained, moderately permeable soils along small drainageways. They formed in silty alluvium washed mostly from nearby loess-covered uplands. Slopes are less than 2 percent.

Haymond soils are similar to Dockery soils and are commonly adjacent to Dockery, Sensabaugh, Twomile, and Westerville soils. Dockery soils have mottles in chroma of 2 within 20 inches of the surface. Sensabaugh soils have a cherty IIC horizon and are on similar positions on the landscape. Twomile soils are grayer than Haymond soils, have a B horizon, and are on terraces. Westerville soils are grayer and are on low terraces.

Typical pedon of Haymond silt loam, 1,600 feet north and 250 feet west of the southeast corner of section 18, T. 44 N., R. 1 E.; UTM coordinates 678,770m E. and 4,270,220m N.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, brown (10YR 5/3) dry; moderate very fine granular structure; very friable; common roots; medium acid; abrupt smooth boundary.

C1—10 to 41 inches; brown (10YR 4/3) silt loam; massive; very friable; few roots; medium acid; clear smooth boundary.

C2—41 to 60 inches; brown (10YR 4/3) silt loam; massive; very friable; medium acid.

The thickness of the solum ranges from 6 to 10 inches and is the same as that of the Ap or A1 horizon. Reaction ranges from medium acid to neutral throughout.

The A horizon is dark grayish brown (10YR 4/2), dark brown (10YR 4/3), or brown (10YR 5/3). The C horizon

is typically brown (10YR 5/3) or dark brown (10YR 4/3). Some pedons are mottled below a depth of 40 inches and contain up to 5 percent coarse fragments. The 10- to 40-inch control section averages between 12 and 18 percent clay.

Haynie series

The Haynie series consists of deep, well drained, moderately permeable soils on the Missouri River flood plain. They formed in recently deposited alluvium. Slopes are less than 2 percent.

Haynie soils are similar to Blake and Haymond soils and are commonly adjacent to Blake, Carr, and Lomax soils. Blake soils have more clay. Carr soils have more sand throughout and are higher on the landscape than Haynie soils. Haymond soils have a lighter colored surface layer. Lomax soils have a thicker mollic epipedon, more sand, and are on terraces.

Typical pedon of Haynie silt loam, 2,400 feet north and 950 feet west of the southeast corner of Spanish survey 44, T. 45 N., R. 2 E.; UTM coordinates 695,080m E. and 4,278,710m N.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; common roots; neutral; abrupt smooth boundary.

C1—10 to 52 inches; finely stratified dark grayish brown (10YR 4/2) very fine sandy loam; single grain; loose; common roots; slight effervescence; neutral; clear smooth boundary.

C2—52 to 60 inches; finely stratified grayish brown (10YR 5/2) loamy very fine sand; few medium prominent dark yellowish brown (10YR 4/6) mottles; single grain; loose; strong effervescence; mildly alkaline; abrupt smooth boundary.

The solum is 6 to 10 inches thick and corresponds to the A horizon.

The A horizon is dark grayish brown or dark brown (10YR 3/2 or 3/3). Texture is generally silt loam, but the range includes very fine sandy loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The 10- to 40-inch control section averages between 30 and 60 percent sand but is less than 15 percent fine sand or coarser and is less than 18 percent clay.

Herrick series

The Herrick series consists of deep, somewhat poorly drained, moderately slowly permeable soils on upland divides. They formed in loess. Slopes range from 2 to 5 percent.

Herrick soils are similar to Mexico soils and are commonly adjacent to Kennebec and Weller soils. The Mexico soils have a thinner dark-colored surface layer than Herrick soils and have more clay in the B horizon. Kennebec soils have a mollic epipedon more than 36 inches thick, do not have a B horizon, and are on flood plains. Weller soils do not have a mollic epipedon and are below the Herrick soils on the landscape.

Typical pedon of Herrick silt loam, 2 to 5 percent slopes, 200 feet east and 250 feet north of the southwest corner of section 36, T. 48 N., R. 2 E.; UTM coordinates 695,380m E. and 4,304,540m N.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; very friable; slightly acid; abrupt smooth boundary.

A12—9 to 17 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; very friable; slightly acid; clear smooth boundary.

A2—17 to 22 inches; dark grayish brown (10YR 4/2) silt loam; weak very fine granular structure; friable; few small pockets of material from the A1 horizon; few fine dark concretions; medium acid; clear smooth boundary.

B21t—22 to 26 inches; brown (10YR 5/3) silty clay loam; common fine faint dark grayish brown (10YR 4/2) and distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; common fine pores; thin patchy clay films on faces of peds; strongly acid; clear smooth boundary.

B22t—26 to 33 inches; mixed dark grayish brown (10YR 4/2) and brown (10YR 5/3) silty clay loam; many fine prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak fine subangular blocky; firm; thin patchy clay films on faces of prisms and in root channels; strongly acid; clear smooth boundary.

B23t—33 to 43 inches; brown (10YR 5/3) silty clay loam; common fine distinct grayish brown (10YR 4/6) mottles; moderate medium prismatic structure parting to weak fine subangular blocky; firm; thin patchy clay films on faces of prisms and in root channels; medium acid; clear smooth boundary.

B3—43 to 60 inches; brown (10YR 5/3) silty clay loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure; firm; thin clay films in old root channels; few black stains; medium acid.

The thickness of the solum ranges from 48 to more than 60 inches. The mollic epipedon ranges from 10 to 17 inches in thickness.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. The upper 20 inches of the argillic horizon average between 35 and 42 percent clay.

Hodge series

The Hodge series consists of deep, somewhat excessively drained, rapidly permeable soils on the Missouri River flood plains. They formed in recent sandy alluvium. Slopes range from 0 to 2 percent.

Hodge soils are commonly adjacent to Carr soils. Carr soils have less sand and are just below the Hodge soils on the landscape.

Typical pedon of Hodge loamy fine sand, 850 feet south and 4,550 feet east of the northwest corner of Spanish survey 1643, T. 45 N., R. 2 E.; UTM coordinates 693,510m E. and 4,274,600m N.

Ap—0 to 7 inches; dark brown (10YR 3/3) loamy fine sand, grayish brown (10YR 5/2) dry; single grain; loose; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—7 to 20 inches; brown (10YR 5/3) fine sand; single grain; loose; slight effervescence; mildly alkaline; abrupt smooth boundary.

C2—20 to 24 inches; thinly stratified dark grayish brown (10YR 4/2) very fine sandy loam and loamy fine sand; massive; very friable; common fine yellowish red (5YR 4/6) stains along most root channels and lamellae; slight effervescence; mildly alkaline; abrupt smooth boundary.

C3—24 to 27 inches; laminated brown (10YR 5/3) loamy fine sand; single grain; loose; common fine yellowish red (5YR 4/6) stains along root channels and lamellae; slight effervescence; mildly alkaline; clear smooth boundary.

C4—27 to 60 inches; grayish brown (10YR 5/2) fine sand with strata of loamy fine sand; single grain; loose; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 3 to 10 inches and is the same as the thickness of the A horizon. Thickness of the sandy regolith is generally more than 60 inches.

The A horizon is dark brown (10YR 3/3 or 4/3) or very dark grayish brown (10YR 3/2). It generally is loamy fine sand, but the range includes fine sand. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Texture is typically loamy fine sand or fine sand, but many pedons have thin strata of finer textured material.

Holstein series

The Holstein series consists of deep, well drained, moderately permeable soils on uplands. They formed in colluvial materials weathered from sandstone, limestone, and shale. Slopes range from 14 to 35 percent.

Holstein soils are commonly adjacent to Goss and Winfield soils. Goss soils have more chert throughout than Holstein soils, and Winfield soils have less sand. Both of these soils are on higher positions on the landscape than Holstein soils.

Typical pedon of Holstein loam, 14 to 35 percent slopes, 850 feet south and 2,450 feet east of the northwest corner of section 12, T. 44 N., R. 1 E.; UTM coordinates 686,100m E. and 4,273,010m N.

A1—0 to 6 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; moderate very fine granular structure; very friable; many fine roots; slightly acid; clear smooth boundary.

A&B—6 to 14 inches; mixed brown (10YR 5/3) (A2) and strong brown (7.5Y 4/6) (B2) loam; moderate very fine granular structure; friable; common fine roots; medium acid; clear smooth boundary.

B21t—14 to 24 inches; yellowish red (5YR 5/6) clay loam; moderate very fine subangular blocky structure; very firm; common fine roots; strong brown (7.5YR 5/6) silt coatings on faces of peds; medium acid; gradual smooth boundary.

B22t—24 to 42 inches; strong brown (7.5YR 5/6) clay loam; common fine distinct yellowish red (5YR 5/6) and common fine distinct yellowish brown (10YR 5/4) mottles; weak very fine subangular blocky structure; very firm; common fine roots; common black stains; strongly acid; gradual smooth boundary.

B3—42 to 60 inches; strong brown (7.5YR 5/6) sandy clay loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak very fine subangular blocky structure; friable; common fine roots; medium acid.

The thickness of the solum is more than 60 inches. The coarse fragment content of the solum ranges from 0 to 10 percent.

The A1 horizon is dark brown (10YR 3/3) or very dark grayish brown (10YR 3/2). Texture is generally loam, but the range includes silt loam. The B horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 8. Texture is clay loam or sandy clay loam. The upper 20 inches of the argillic horizon averages between 27 and 35 percent clay.

Hurst series

The Hurst series consists of deep, somewhat poorly drained, very slowly permeable soils on low terraces. These soils formed in acid alluvium. Slopes range from 0 to 2 percent.

Hurst soils are commonly adjacent to Carlow, Twomile, and Kampville soils. Carlow soils have a mollic epipedon. Carlow and Kampville soils do not have an argillic horizon and are lower on the landscape. Twomile soils have a compact, brittle A2 horizon, have more clay in the argillic horizon, and are higher than Hurst soils.

Typical pedon of Hurst silt loam, about 500 feet south and 750 feet east of the Highway 79 bridge over the Cuivre River at Old Monroe; UTM coordinates 695,700m E. and 4,310,920m N.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; common roots; slightly acid; abrupt smooth boundary.

A2—10 to 16 inches; grayish brown (10YR 5/2) silt loam; weak thin platy structure; firm (weakly brittle); few roots; fine rounded concretions; many silt coatings; strongly acid; clear smooth boundary.

B21t— 16 to 24 inches; dark grayish brown (10YR 4/2) silty clay loam; many fine distinct brown (10YR 5/3) and common fine distinct strong brown (7.5YR 4/6) mottles; weak fine subangular blocky structure; firm (dense); few roots; few thin clay films in root pores; few silt coatings; strongly acid; clear smooth boundary.

B22t—24 to 36 inches; dark grayish brown (10YR 4/2) silty clay loam; many fine distinct brown (10YR 5/3) and common fine prominent strong brown (7.5YR 4/6) mottles; weak very fine subangular blocky structure; firm; few roots; few thin clay films in pores; few silt coatings; strongly acid; clear smooth boundary.

B3—36 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent strong brown (7.5YR 4/6) mottles; massive parting to weak very fine subangular blocky structure; firm; medium acid.

The thickness of the solum is generally more than 45 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 or 3. It is silt loam or silty clay loam. Reaction of the A horizon ranges from strongly acid to neutral. The B horizon has hue of 10YR, value of 4 to 6, and chroma of 2, with mottles of higher chroma. Texture is typically silty clay loam. The clay average of the 10- to 40-inch control section is 27 to 35 percent. Reaction ranges from strongly acid to medium acid.

Kampville series

The Kampville series consists of deep, somewhat poorly drained, moderately slowly permeable soils on the Mississippi River flood plain. They formed in acid alluvium. Slopes range from 0 to 2 percent.

Kampville soils are commonly adjacent to Carlow, Chequest, and Hurst soils. Carlow and Chequest soils are on landscape positions similar to Kampville soils but have a mollic epipedon and contain more clay than Kampville soils. Hurst soils are on low terrace positions and are not as gray.

Typical pedon of Kampville silt loam, 1,100 feet west and 100 feet north of the southeast corner of section 12, T. 47 N., R. 3 E.; UTM coordinates 706,190m E. and 4,301,520m N.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium platy structure parting to weak very fine granular; very friable; many fine roots; medium acid; clear smooth boundary.

A2—7 to 13 inches; grayish brown (10YR 5/2) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak very fine subangular blocky structure; friable; few fine roots; common pale brown (10YR 6/3) silt coatings on faces of peds; strongly acid; clear smooth boundary.

B21tg—13 to 24 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct brown (7.5YR 4/4) mottles; weak very fine subangular blocky structure; friable; few fine roots; few patchy clay films on faces of peds; strongly acid; clear smooth boundary.

B22tg—24 to 31 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct brown (7.5YR 4/4) mottles; weak very fine subangular blocky structure; friable; few fine roots; thin clay flows in root channels and thin discontinuous clay films on faces of peds; few fine black (10YR 2/1) concretions (iron and manganese oxides) and stains; strongly acid; clear smooth boundary.

B23tg—31 to 41 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct brown (7.5YR 4/4) mottles; weak very fine subangular blocky structure; friable; few patchy clay films on faces of peds and thin clay flows in root channels; few fine black (10YR 2/1) concretions (iron and manganese oxides) and stains; strongly acid; clear smooth boundary.

Cg—41 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct brown (7.5YR 4/4) mottles; massive; friable; common fine black (10YR 2/1) concretions (iron and manganese oxides) and stains; medium acid.

The thickness of the solum is typically more than 35 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The A2 horizon is weakly expressed. Some pedons do not have an A2 horizon. Reaction of the A horizon is typically medium acid to strongly acid, but it is less acid where limed. The B2 horizon is dominantly hue of 10YR, value of 4 or 5, and chroma of 2 with brownish mottles. Texture is silty clay loam or silty clay. The average clay content of the control section is between 35 and 48 percent. Reaction is strongly acid or very strongly acid.

Kennebec series

The Kennebec series consists of deep, moderately well drained, moderately permeable soils on flood plains. They formed in silty, dark-colored alluvium. Slopes range from 0 to 2 percent.

Kennebec soils are commonly adjacent to Dockery and Herrick soils. Dockery soils do not have a mollic epipedon and are on similar positions on the landscape. Herrick soils have a mollic epipedon that is less than 20 inches thick, have an argillic horizon, and are on uplands.

Typical pedon of Kennebec silt loam, about 2,425 feet west and 1,600 feet north of the junction of Freymuth Road and Highway Y; UTM coordinates 692,910m E. and 4,306,690m N.

Ap—0 to 11 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate very fine granular structure; very friable; slightly acid; clear smooth boundary.

A12—11 to 23 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular structure; very friable; medium acid; clear smooth boundary.

A13—23 to 29 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate very fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

A14—29 to 37 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate very fine subangular blocky structure; friable; medium acid; clear smooth boundary.

C1—37 to 50 inches; dark gray (10YR 4/1) silty clay loam; massive; friable; slightly acid; clear smooth boundary.

C2—50 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; massive; friable; slightly acid.

The solum and mollic epipedon are more than 36 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Some pedons have a dark grayish brown (10YR 4/2) overwash. Reaction is medium acid to slightly acid. Texture is silty loam or silty clay loam. The C horizon has color value of 3 to 5 and chroma of 1 or 2. Reaction is neutral to slightly acid.

Keswick series

The Keswick series consists of deep, moderately well drained, slowly permeable soils on uplands. They formed in glacial materials. Slopes range from 9 to 14 percent.

Keswick soils are similar to Armster and Lindley soils and are commonly adjacent to Armster, Goss, Lindley, and Mexico soils. Armster soils have a dark-colored surface layer. Goss soils are cherty throughout and are lower on the landscape than Keswick soils. Lindley soils are not as red in the subsoil. Mexico soils have less sand in the upper 30 inches and are on side slopes above Keswick soils.

Typical pedon of Keswick silt loam, 9 to 14 percent slopes, eroded, 1,100 feet north and 2,540 feet east of the southwest corner of section 31, T. 48 N., R. 1 E.; UTM coordinates 677,880m E. and 4,304,600m N.

Ap—0 to 3 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate very fine granular structure; friable; common very fine roots; slightly acid; clear smooth boundary.

B1—3 to 8 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak very fine subangular blocky structure; friable; few very fine roots; strongly acid; clear smooth boundary.

B21t—8 to 15 inches; strong brown (7.5YR 5/6) clay loam; common fine prominent light brownish gray (10YR 6/2) and few fine prominent yellowish red (5YR 4/6) mottles; moderate very fine subangular blocky structure; firm; thin patchy clay films; few very fine roots; very strongly acid; clear smooth boundary.

B22t—15 to 25 inches; strong brown (7.5YR 5/6) clay; common medium prominent light brownish gray (10YR 6/2) mottles; moderate very fine subangular blocky structure; firm; thin patchy clay films; very strongly acid; abrupt smooth boundary.

IIB23t—25 to 35 inches; strong brown (7.5YR 5/6) clay; common fine prominent red (10YR 4/8) mottles; moderate very fine subangular blocky structure; firm; thick continuous clay films on faces of peds; thin band of chert 2 inches thick in the upper part of the horizon; medium acid; clear smooth boundary.

IIB24t— 35 to 60 inches; strong brown (7.5YR 5/6) clay; many medium prominent red (10YR 4/8) mottles; moderate very fine subangular blocky structure; firm; thick continuous clay films on faces of peds; estimated 5 percent coarse fragments; medium acid.

The depth of the solum, except where severely eroded, is generally more than 48 inches. Some pedons do not have a stone line in the upper part of the IIB horizon.

The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 4/3). It usually is silt loam, but the range includes loam. Some profiles have a thin, very dark grayish brown (10YR 3/2) A1 horizon. The A2 horizon, if there is one, is grayish brown (10YR 5/2), dark grayish brown (10YR 4/2), or brown (10YR 5/3) loam or silt loam. The IIB2t horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 or 6. Texture is clay, clay loam, or silty clay. The clay content of the control section averages between 35 and 48 percent.

Lindley series

The Lindley series consists of deep, well drained, moderately slowly permeable soils on uplands. They formed in glacial till. Slope ranges from 14 to 20 percent.

These soils contain more clay in the subsoil than is defined as the range for the Lindley series, but this

difference does not significantly affect the use or behavior of the soils.

Lindley soils are similar to and are commonly adjacent to Hatton and Keswick soils. Hatton soils do not have glacial sand and pebbles in the upper 27 to 38 inches of the solum. Keswick soils have a redder subsoil than Lindley soils and have mottles in chroma of 2 in the upper 10 inches of the argillic horizon.

Typical pedon of Lindley loam, 14 to 20 percent slopes, 100 feet north and 300 feet west of the southeast corner of section 11, T. 46 N., R. 1 E.; UTM coordinates 685,180m E. and 4,291,260m N.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; very friable; many fine roots; strongly acid; clear smooth boundary.

A2—3 to 10 inches; light yellowish brown (10YR 6/4) loam; moderate very fine granular structure; very friable; common fine roots; extremely acid; clear smooth boundary.

B21t—10 to 15 inches; yellowish brown (10YR 5/6) clay; common fine distinct light yellowish brown (10YR 6/4) mottles; moderate very fine subangular blocky structure; friable; common fine roots; common sand grains and chert fragments; thin continuous clay films; extremely acid; clear smooth boundary.

B22t—15 to 24 inches; strong brown (7.5YR 5/6) clay; few fine prominent pale brown (10YR 6/3) mottles; moderate fine subangular blocky structure; firm; few fine roots; common sand grains and chert fragments; thin continuous clay films; extremely acid; clear smooth boundary.

B23t—24 to 37 inches; strong brown (7.5YR 5/6) clay; common medium prominent light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure; very firm; few fine roots; common chert fragments and glacial sand grains; thin continuous clay films; very strongly acid; clear smooth boundary.

C—37 to 60 inches; mottled strong brown (7.5YR 4/6) and grayish brown (2.5YR 5/2) clay loam; massive; very firm; few fine roots; common chert fragments and rounded sand grains; few fine soft masses of lime; strong effervescence; mildly alkaline.

The thickness of the solum generally is 30 to 50 inches. Glacial pebbles are commonly mixed throughout the profile.

The A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2 and ranges in thickness from 3 to 6 inches. The A2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6. The A horizon is generally loam, but the range includes silt loam. The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. Texture is clay loam or clay. The upper 20 inches of the argillic horizon averages between 35 and 45 percent clay. Reaction ranges from extremely acid to slightly acid.

Lomax series

The Lomax series consists of deep, well drained, moderately rapidly permeable soils on terraces. They formed in loamy and sandy alluvium. Slopes range from 0 to 2 percent.

Lomax soils are commonly adjacent to Blase, Haynie, and Waldron soils. Blase soils have clayey over loamy textures and are slightly lower on the landscape than Lomax soils. Haynie soils have a thinner mollic surface layer, have less sand, and are on flood plains. Waldron soils have more clay throughout and are in low drainageways.

Typical pedon of Lomax loam, 1,775 feet west and 900 feet south of the northeast corner of section 12, T. 47 N., R. 5 E.; UTM coordinates 725,100m E. and 4,303,100m N.

Ap—0 to 7 inches; very dark gray (10YR 3/1) loam; dark gray (10YR 4/1) dry; weak fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

A12—7 to 14 inches; very dark grayish brown (10YR 3/2) very fine sandy loam, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.

A13—14 to 24 inches; dark brown (10YR 3/3) very fine sandy loam, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure; very friable; common fine roots; common worm casts; slightly acid; clear smooth boundary.

B2—24 to 40 inches; yellowish brown (10YR 5/4) very fine sandy loam; weak very fine subangular blocky structure; very friable; common worm casts; medium acid; clear smooth boundary.

C—40 to 60 inches; pale brown (10YR 6/3) loamy very fine sand; massive; loose; medium acid.

The thickness of the solum ranges from 40 to 60 inches. The mollic epipedon ranges from 24 to 32 inches in thickness.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. Texture of the 10- to 40-inch control section is loam or very fine sandy loam. The range includes loamy sand or sand below a depth of 40 inches. Reaction of the B horizon is medium acid to slightly acid. The C horizon is loamy sand or sand. It ranges from medium acid to neutral.

Marion series

The Marion series consists of deep, somewhat poorly drained, very slowly permeable soils on uplands. They formed in loess. Slopes range from 0 to 2 percent.

Marion soils are similar to Auxvasse soils and are commonly adjacent to Hatton soils. Auxvasse soils have a grayer argillic horizon. Hatton soils do not have mottles in chroma of 2 in the upper part of the B horizon, have glacial sand and pebbles in the lower part, and are on lower side slopes.

Typical pedon of Marion silt loam, 600 feet west and 1,600 feet south of the northeast corner of section 36, T. 47 N., R. 1 E.; UTM coordinates 686,670m E. and 4,295,520m N.

Ap—0 to 7 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; moderate very thin platy structure parting to weak very fine granular; friable; many fine roots; common fine black concretions; slightly acid; abrupt smooth boundary.

A2—7 to 13 inches; light brownish gray (10YR 6/2) silt loam; weak medium platy structure parting to moderate very fine granular; friable; common fine roots; slightly acid; abrupt smooth boundary.

B21t—13 to 20 inches; brown (10YR 5/3) silty clay; few fine red (2.5YR 4/6) mottles; strong very fine subangular blocky structure; firm; common fine roots; few thin clay films; few fine black concretions; light brownish gray (10YR 6/2) silt coatings on faces of peds; very strongly acid; clear smooth boundary.

B22t—20 to 32 inches; brown (10YR 5/3) silty clay; few medium faint light brownish gray (10YR 6/2) and common fine faint yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate very fine subangular blocky; firm; few fine roots; few patchy clay films; few fine concretions; very strongly acid; clear smooth boundary.

B3—32 to 44 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and common fine distinct yellowish brown (10YR 5/6) mottles; weak prismatic structure parting to weak very fine subangular blocky; firm; few fine roots; very strongly acid; clear smooth boundary.

C—44 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent strong brown (7.5YR 5/8) mottles; massive; friable; common black stains and common fine rounded sand grains; very strongly acid.

The thickness of the solum ranges from 40 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 5 to 7, and chroma of 2 or 3. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. The upper 20 inches of the argillic horizon averages between 48 and 60 percent clay. The B horizon typically ranges from very strongly acid to medium acid.

Menfro series

The Menfro series consists of deep, well drained, moderately permeable soils on uplands. They formed in silty loess. Slopes range from 2 to 30 percent.

Menfro soils are similar to Crider, Harvester, and Winfield soils and are commonly adjacent to Crider, Harvester, Hatton, Weller, and Winfield soils. Crider soils have a redder B horizon than Menfro soils. Harvester soils formed in man-disturbed loess. Hatton soils have more clay and formed in 30 to 50 inches of loess underlain by glacial till. Weller soils have more clay, have grayish brown mottles in the upper 10 inches of the argillic horizon, and are on wider ridges. Winfield soils have grayish brown mottles in the lower part of the argillic horizon.

Typical pedon of Menfro silt loam, 5 to 9 percent slopes, 300 feet north and 2,725 feet west of the southeast corner of section 9, T. 46 N., R. 4 E.; UTM coordinates 710,380m E. and 4,291,680m N.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium platy structure parting to moderate very fine granular; very friable; many fine roots; slightly acid; abrupt smooth boundary.

B1—8 to 14 inches; brown (7.5YR 4/4) silt loam; moderate very fine subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

B21t—14 to 24 inches; brown (7.5YR 4/4) silty clay loam; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate very fine subangular blocky; firm; common fine roots; common thin clay films; common silt coatings; strongly acid; clear smooth boundary.

B22t—24 to 43 inches; brown (7.5YR 4/4) silty clay loam; weak medium prismatic structure; firm; common fine roots; common silt coatings and thin clay films; strongly acid; gradual smooth boundary.

B3t—43 to 59 inches; brown (7.5YR 4/4) silt loam; common fine distinct brown (10YR 5/3) and common fine distinct dark yellowish brown (10YR 3/4) mottles; weak medium prismatic structure; friable; thin dark yellowish brown (10YR 3/4) clay films on faces of peds and old root channels; strongly acid; gradual smooth boundary.

C—59 to 67 inches; dark yellowish brown (10YR 4/4) silt loam; common fine faint brown (10YR 5/3) and common fine faint dark yellowish brown (10YR 3/4) mottles; massive; friable; common very fine sand grains; medium acid.

The thickness of the solum typically is more than 50 inches but ranges to 38 inches.

The Ap horizon is brown (10YR 3/3 & 4/3) or dark grayish brown (10YR 4/2). Some pedons have a thin, very dark grayish brown (10YR 3/2) A1 horizon. The B2t horizon has hue of 10YR or 7.5YR. The upper 20 inches of the argillic horizon averages between 30 and 35 percent clay. Reaction ranges from strongly acid to neutral.

Mexico series

The Mexico series consists of deep, somewhat poorly drained, very slowly permeable soils on uplands. They formed in loess and the underlying glacial sediments. Slopes range from 1 to 5 percent.

Mexico soils are similar to Herrick soils and are commonly adjacent to Armster and Keswick soils. Armster soils have more sand throughout and are not as gray as the Mexico soils. Herrick soils have a mollic epipedon and less clay in the B horizon. Keswick soils have more sand and a lighter colored surface layer. Armster and Keswick soils are on side slopes lower on the landscape.

Typical pedon of Mexico silt loam, 1 to 5 percent slopes, 2,600 feet south and l,900 feet west of the northeast corner of section 19, T. 47 N., R. 1 E.; UTM coordinates 678,100m E. and 4,298,460m N.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine granular structure; very friable; many fine roots; flecks of dark grayish brown (10YR 4/2) silt loam A2 material; many fine concretions; slightly acid; abrupt smooth boundary.

A2—7 to 13 inches; brown (10YR 4/3) silt loam; few fine prominent yellowish red (5YR 4/6) mottles; moderate fine subangular blocky structure parting to moderate very fine granular; friable; common fine roots; common fine concretions; common silt coatings; strongly acid; clear smooth boundary.

B21t—13 to 22 inches; dark grayish brown (10YR 4/2) silty clay loam; many fine and medium distinct brown (10YR 4/3) and prominent red (2.5YR 4/6) mottles; moderate very fine subangular blocky structure; firm; few fine roots; few thin clay films; common silt coatings; strongly acid; clear smooth boundary.

B22t—22 to 31 inches; grayish brown (10YR 5/2) silty clay; many fine and medium distinct dark yellowish brown (10YR 4/4) and prominent yellowish red (5YR 4/6) mottles; moderate very fine subangular blocky structure; firm; few fine roots; few thin clay films; few silt coatings; strongly acid; clear smooth boundary.

IIC—31 to 70 inches; grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct brown (7.5YR 4/4) mottles; massive; friable; few fine roots; few black stains and common rounded sand grains; slightly acid.

The thickness of the solum ranges from 25 to more than 50 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. It ranges in thickness from 6 to 10 inches. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 and has red and brown mottles. It is silty clay loam or silty clay. Reaction ranges from very strongly acid to medium acid.

Portage series

The Portage series consists of deep, very poorly drained, very slowly permeable soils on the Mississippi River flood plain. They formed in acid clayey alluvium. Slopes range from 0 to 1 percent.

Portage soils are similar to Booker soils and are commonly adjacent to Blase and Carlow soils. Booker soils are less acid than Portage soils. Blase soils have clayey over loamy textures and are on low terraces. Carlow soils have less clay and are on similar positions on the landscape.

Typical pedon of Portage clay 2,140 feet north and 400 feet east of the southwest corner of section 11, T. 48 N., R. 5 E.; UTM coordinates 722,500m E. and 4,312,200m N.

Ap—0 to 4 inches; black (10YR 2/1) clay, dark gray (10YR 4/1) dry; strong very fine blocky structure; firm; medium acid; abrupt smooth boundary.

A12—4 to 9 inches; very dark gray (10YR 3/1) clay, gray (10YR 5/1) dry; few fine faint dark grayish brown (10YR 4/2) mottles; moderate very fine subangular blocky structure; firm; medium acid; clear smooth boundary.

A13—9 to 14 inches; very dark grayish brown (10YR 3/2) clay, grayish brown (10YR 5/2) dry; common very dark gray (10YR 3/1) material from the horizon above; moderate fine and very fine subangular blocky structure; firm; strongly acid; clear smooth boundary.

B1g—14 to 24 inches; dark gray (10YR 4/1) clay; common fine distinct brown (10YR 4/3) mottles; moderate fine and very fine subangular blocky structure; firm; strongly acid; gradual smooth boundary.

B21g—24 to 40 inches; dark gray (N 4/0) clay; few fine distinct brown (10YR 4/3) mottles; moderate fine and very fine angular and subangular blocky structure; firm; strongly acid; gradual smooth boundary.

B22g—40 to 75 inches; dark grayish brown (2.5YR 4/2) clay; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure parting to weak fine and very fine angular and subangular blocky; firm; strongly acid.

The thickness of the solum is more than 60 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is most commonly clay, but the range includes silty clay. Reaction is typically medium acid to strongly acid but is less acid where limed. The Bg horizon has hue of 10YR, 2.5Y, 5Y, or neutral, value of 4 or 5, and chroma of 0 to 2 and has brownish mottles. The 10- to 40-inch control section is strongly acid or very strongly acid. The average clay content of the control section ranges from 60 to 75 percent.

Sensabaugh series

The Sensabaugh series consists of deep, well drained, moderately rapidly permeable soils on stream flood plains. They formed in loamy and silty alluvium from soils underlain by limestone, sandstone, and shale. Slopes range from 0 to 2 percent.

Sensabaugh soils are commonly adjacent to Haymond and Cedargap soils. Haymond soils do not have a cherty IIC horizon. Cedargap soils are more cherty in the upper part of the control section than Sensabaugh soils but are on similar positions on the landscape.

Typical pedon of Sensabaugh silt loam, about 375 feet east and 100 feet north of the junction of Femme Osage Creek Road and Becker-Joerling Road; UTM coordinates 681,900m E. and 4,280,000m N.

Ap—0 to 5 inches; dark brown (7.5YR 4/2) silt loam, brown (10YR 5/3) dry; weak very fine subangular blocky structure parting to weak very fine granular; very friable; many fine roots; about 5 percent coarse fragments; neutral; clear smooth boundary.

B21—5 to 16 inches; brown (7.5YR 4/4) silt loam; moderate very fine subangular blocky structure; very friable; common fine roots; about 5 percent coarse fragments; neutral; diffuse smooth boundary.

B22—16 to 30 inches; brown (7.5YR 4/4) silt loam; weak very fine subangular blocky structure; very friable; few fine roots; about 5 percent coarse fragments; slightly acid; clear wavy boundary.

IIC1—30 to 48 inches; dark reddish brown (5YR 3/3) very cherty loam; massive; friable; few fine roots; estimated 60 percent chert fragments (5 percent is 3 inches or more in diameter, 55 percent is 2 millimeters to 3 inches); medium acid; gradual wavy boundary.

IIC2—48 to 60 inches; brown (7.5YR 4/2) very cherty sandy clay loam; massive; friable; few fine roots; estimated 60 percent chert fragments (20 percent is 3 inches or more in diameter, 40 percent is 2 millimeters to 3 inches); slightly acid.

The thickness of the solum or depth to the cherty horizons ranges from 24 to 40 inches. Reaction ranges from medium acid to neutral throughout the profile.

The Ap horizon has hue of 7.5YR or 10YR, value of 3 or 4, and chroma of 2 or 3. The B horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 2 to 4. Chert content is typically less than 10 percent. The IIC horizon is loam or sandy clay loam in the fine earth fraction. Chert content ranges from 35 to about 70 percent.

Twomile series

The Twomile series consists of deep, poorly drained, slowly permeable soils on stream terraces. They formed in silty alluvium. Slopes range from 0 to 2 percent.

Twomile soils are commonly adjacent to Haymond and Hurst soils. Haymond soils are not as gray as Twomile soils, do not have a B horizon, and are on flood plains. Hurst soils do not have an A2 horizon, have less clay in the B horizon, and are on lower positions on the landscape.

Typical pedon of Twomile silt loam, about 75 feet east of Highway 61, 1,100 feet south of the Cuivre River; UTM coordinates 680,720m E. and 4,305,810m N.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak very thin platy structure parting to granular; very friable; common fine roots; slightly acid; abrupt smooth boundary.

A21—6 to 11 inches; grayish brown (10YR 5/2) silt loam; moderate very fine granular structure; very friable; few fine roots; few fine black concretions; medium acid; clear smooth boundary.

A22—11 to 18 inches; light brownish gray (10YR 6/2) silt loam; common fine prominent strong brown (7.5YR 5/8) mottles; moderate thin platy structure; friable; few fine roots; few fine black concretions; medium acid; abrupt smooth boundary.

A23x—18 to 28 inches; light brownish gray (10YR 6/2) silt loam; common fine faint grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; firm, compact and dense; few fine black concretions; very strongly acid; clear smooth boundary.

B21t—28 to 33 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct strong brown (7.5YR 5/8) mottles; moderate fine subangular blocky structure; firm; very strongly acid; gradual smooth boundary.

B22t—33 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; weak fine prismatic structure parting to moderate fine subangular blocky; firm; very strongly acid.

The thickness of the solum is typically more than 60 inches.

The Ap horizon is commonly medium acid, but is less acid where limed. The A2 and A2x horizons have hue of 10YR, value of 5 or 6, and chroma of 1 or 2 and have mottles of higher chroma. Reaction is typically medium acid to very strongly acid. The A horizon ranges from 26 to 36 inches in thickness. The B2t horizon has hue of

10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2 and has mottles of higher chroma. Reaction ranges from medium acid to very strongly acid.

Waldron series

The Waldron series consists of deep, somewhat poorly drained, slowly permeable soils on the Missouri River flood plain. They formed in clayey alluvium. Slopes range from 0 to 2 percent.

These soils do not have free carbonates in the 10- to 20-inch control section, as is defined as the range for the Waldron series, but this difference does not affect the use or behavior of the soil.

Waldron soils are commonly adjacent to Blake and Booker soils. Blake soils have less clay and are slightly above the Waldron soils on the landscape. Booker soils contain more clay, are grayer, and are lower.

Typical pedon of Waldron silty clay, in Darst bottoms, about 1 mile east of the Highway 94 bridge over Femme Osage Creek, about 25 feet north and 50 feet west of the southeast corner of Spanish survey 476, T. 45 N., R. 2 E.; UTM coordinates 695,180m E. and 4,279,560m N.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) dry; weak very fine granular structure; firm; few roots; slightly acid; clear smooth boundary.

C1—6 to 15 inches; dark grayish brown (10YR 4/2) silty clay; weak very fine granular structure; firm; few roots; neutral; clear smooth boundary.

C2—15 to 25 inches; grayish brown (10YR 5/2) silty clay; common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate fine subangular blocky structure; firm; few roots; neutral; gradual smooth boundary.

C3—25 to 35 inches; stratified grayish brown (10YR 5/2) silty clay; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate very fine subangular blocky structure; firm; few fine roots; slight effervescence; neutral; gradual smooth boundary.

C4—35 to 41 inches; dark grayish brown (10YR 4/2) silty clay; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate very fine subangular blocky structure; firm; few fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

C5—41 to 60 inches; grayish brown (10YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4) and common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate very fine subangular blocky structure; firm; mildly alkaline; slight effervescence.

The thickness of the solum ranges from 6 to 10 inches and is the same as the thickness of the Ap horizon. Reaction ranges from slightly acid to moderately alkaline throughout.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. The C horizon typically is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2) silty clay loam or silty clay. Thin strata of coarser or finer material are common in many pedons. The 10- to 40-inch control section averages between 35 and 50 percent clay.

Weller series

The Weller series consists of deep, moderately well drained, slowly permeable soils on uplands. They formed in loess. Slopes range from 0 to 9 percent.

Weller soils are similar to Freeburg soils and are commonly adjacent to Herrick and Menfro soils. Freeburg soils have less clay in the B horizon than Weller soils. Herrick soils have a mollic epipedon and are on higher positions on the landscape. Menfro soils do not have mottles in chroma of 2 in the argillic horizon and are on narrow ridges that are lower on the landscape.

Typical pedon of Weller silt loam, 2 to 5 percent slopes, 250 feet west and 250 feet north of the intersection of State Highways P and M, T. 47 N., R. 3 E.; UTM coordinates 699,690m E. and 4,300,460m N.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate very fine granular structure; very friable; many fine roots; common fine rounded concretions; slightly acid; abrupt smooth boundary.

B21t—10 to 17 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; common fine roots; few pale brown (10YR 6/3) silt coatings on faces of peds; strongly acid; clear smooth boundary.

B22t—17 to 25 inches; dark yellowish brown (10YR 4/4) silty clay; common fine distinct brown (10YR 5/3), grayish brown (10YR 5/2), and light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; common fine roots; few thin clay films on faces of peds; strongly acid; clear smooth boundary.

B31t—25 to 41 inches; mottled brown (10YR 5/3), yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and light gray (10YR 7/2) silty clay loam; moderate fine prismatic structure; firm; few thick discontinuous dark brown (7.5YR 4/4) clay films; strongly acid; clear smooth boundary.

B32t—41 to 63 inches; brown (10YR 5/3) silty clay loam; common fine faint grayish brown (10YR 5/2) and distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure; friable; few thin clay films; medium acid.

The thickness of the solum is typically 5 feet or more. It is typically strongly acid in its most acid part.

The Ap horizon typically is dark grayish brown (10YR 4/2) or brown (10YR 4/3 & 5/3). In some eroded areas,

the Ap horizon is dark yellowish brown. Some pedons have a thin (10YR 3/1 & 3/2) A1 horizon. The B2t horizon is typically brown (7.5YR 4/4), yellowish brown (10YR 5/4), or dark yellowish brown (10YR 4/4) with mottles in chroma of 2 in the upper 10 inches of the argillic horizon. The upper 20 inches of the argillic horizon averages between 40 and 46 percent clay.

Westerville series

The Westerville series consists of deep, somewhat poorly drained, moderately permeable soils on low stream terraces. They formed in silty alluvium. Slopes are less than 2 percent.

These soils have been recently overwashed and are less acid in the upper part of the profile than is definitive as the range for the Westerville series, but this difference does not significantly affect the use or behavior of the soils.

Westerville soils are commonly adjacent to Auxvasse, Dockery, and Haymond soils. Auxvasse soils contain more clay than Westerville soils and are on slightly higher positions on the landscape. Dockery soils do not have a B horizon, and Haymond soils are brown throughout and contain less clay. Both soils are on stream flood plains.

Typical pedon of Westerville silt loam, 1,150 feet north and 10 feet west of the southeast corner of section 29, T. 47 N., R. 1 E.; UTM coordinates 680,220m E. and 4,296,350m N.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate very fine granular structure; very friable; many fine roots; neutral; clear smooth boundary.

C1—7 to 13 inches; finely stratified brown (10YR 4/3) silt loam; few fine distinct brown (10YR 5/3) and few fine distinct brown (7.5YR 4/4) mottles; weak very fine subangular blocky structure; very friable; common fine roots; neutral; clear smooth boundary.

A11b—13 to 23 inches; dark grayish brown (10YR 4/2) silt loam; common medium faint grayish brown (10YR 5/2) mottles; moderate very fine subangular blocky structure; very friable; common fine roots; slightly acid; clear smooth boundary.

A12b—23 to 37 inches; grayish brown (10YR 5/2) silt loam; common fine faint brown (10YR 5/3) and few fine distinct strong brown (7.5YR 5/6) mottles; weak very fine subangular blocky structure; friable; few fine roots; few concretions; strongly acid; clear smooth boundary.

C2g—37 to 52 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct yellowish brown (10YR 5/8) and common fine faint pale brown (10YR 6/3) mottles; moderate very fine subangular blocky structure; friable; clay pockets; pale brown (10YR 6/3) silt coatings on faces of peds; strongly acid; clear smooth boundary.

C3g—52 to 60 inches; light brownish gray (10YR 6/2) loam; common medium distinct brownish yellow (10YR 6/8) mottles; massive; compact, friable; estimated 10 percent coarse fragments; medium acid.

The thickness of the solum is 40 to 60 inches or more.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Some pedons have an A2 horizon. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2 and has mottles of higher chroma. Texture is silt loam or silty clay loam. The 10- to 40-inch control section averages between 18 and 35 percent clay. Reaction is slightly acid to strongly acid.

Winfield series

The Winfield series consists of deep, moderately well drained, moderately permeable soils on uplands. They formed in silty loess. Slopes range from 5 to 20 percent.

Winfield soils are similar to Crider, Harvester, and Menfro soils and are commonly adjacent to Crider, Harvester, and Menfro soils. Crider and Menfro soils do not have mottles in chroma of 2 in the B horizon. In addition, Crider soils have a redder B2 horizon than Winfield soils. Harvester soils have been truncated and rearranged and do not have an argillic horizon.

Typical pedon of Winfield silt loam, 9 to 14 percent slopes, 1,700 feet east and 2,400 feet south of the northwest corner of section 9, T. 46 N., R. 4 E.; UTM coordinates 710,060m E. and 4,292,540m N.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common very fine roots; slightly acid; abrupt smooth boundary.

B21t—7 to 18 inches; brown (7.5YR 4/4) silty clay loam; moderate very fine subangular blocky structure; firm; few very fine roots; thin patchy clay films in root channels; strongly acid; clear smooth boundary.

B22t—18 to 34 inches; brown (7.5YR 4/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate very fine subangular blocky structure; firm; few very fine roots; thin continuous clay films in root channels; strongly acid; gradual smooth boundary.

B3t—34 to 44 inches; brown (7.5YR 4/4) silt loam; few fine distinct grayish brown (10YR 5/2) mottles; weak very fine subangular blocky structure; friable; few very fine roots; thin patchy clay films in root channels; strongly acid; gradual smooth boundary.

C—44 to 60 inches; brown (7.5YR 4/4) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; medium acid.

The thickness of the solum is more than 40 inches. It is very strongly acid in its most acid part.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). Eroded pedons have a brown (7.5YR 4/4) silty clay loam surface layer. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The upper 10 inches of the B2t horizon does not have mottles in chroma of 2 or less. The lower part has mottles with value of 4 to 6 and chroma of 1 to 6. The upper 20 inches of the argillic horizon averages between 30 and 35 percent clay.

formation of the soils

This section describes the factors of soil formation, relates them to the formation of soils in St. Charles County, and explains the processes of soil formation.

factors of soil formation

Soil is the product of soil-forming processes acting on accumulated or deposited geologic materials. The characteristics of the soil are determined by (1) the type of parent material, (2) plant and animal life on and in the soil, (3) climate under which the soil forming factors were active, (4) relief, or lay of the land, and (5) the length of time these forces have been active.

The parent material affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Plant and animal life, chiefly plants, are active in soil formation. The climate determines the amount of water available for leaching and the amount of heat available for physical and chemical changes. Together, climate and plant and animal life act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. Relief often modifies these other factors. Finally, time is required for changes to be made so that parent material becomes soil. Generally, a long time is required for the development of distinct soil horizons.

These factors of soil formation are all so closely interrelated that few generalizations can be made about the effect of any one factor unless conditions are specified for the other four. Soil formation is complex, and many processes of soil development are still unknown.

parent material

Parent material is the unconsolidated mass from which a soil is formed. The formation or the deposition of this material is the first step in the development of a soil profile. The characteristics of the material determine the limits of chemical and mineralogical composition of the soil. In St. Charles County, four principal kinds of parent material, alone or in combinations of two or more, have contributed to the formation of the soils: residual material weathered from bedrock; glacial, or ice-deposited material; loess, or wind-deposited material; and alluvial, or water-deposited material. Of less importance is colluvium, which is material transported short distances downslope by the action of water and gravity.

Residual material, or residuum, has weathered from limestone, sandstone, and shale. Residuum from cherty limestone and thinly interbedded shale is the parent material of Goss soils. Gasconade and Gatewood soils formed in material weathered from relatively chert-free limestone formations and interbedded shale. Sandstone residuum, mixed with colluvium weathered and transported from limestone and shale upslope, provided the parent material of Holstein soils.

Glacial parent material composed of clay, silt, sand, gravel, stones, and a few boulders was transported by ice action. Much of the material in the glacial till mass was moved long distances, but some of it is of fairly local origin. Armster, Keswick, and Lindley soils formed in glacial till.

Loess, a silty material transported by wind, is the most extensive of the parent materials in the survey area. The principal source of loess was the flood plains of the Missouri and Mississippi Rivers following the retreat of the last glacier. The deepest deposits of loess are on the hills bordering the flood plain, where it is the parent material of Menfro, Winfield, and Weller soils. Further from the source, these windborne deposits were thinner and contained more clay. In the prairie region where this material was deposited on wide, nearly level or gently sloping divides, slow runoff resulted in the formation of somewhat poorly drained soils. Here it is the parent material of the Herrick and Mexico soils. On narrow ridgetops, where loess deposits were thin, the Hatton soils formed in loess and the underlying glacial materials.

The parent material of all the soils on flood plains in St. Charles County is alluvium. Reflecting its diverse origins and the varying speeds of flowing water, this alluvium varies greatly in texture and in chemical and mineralogical composition. Local uplands are the only source of the alluvium on flood plains along small tributary streams. The vast drainage systems of the Mississippi and Missouri Rivers are a source of the parent material along their banks. Along the Missouri River, the Haynie and Blake soils are abundantly supplied with unweathered minerals and are fertile and neutral in reaction. In contrast, the Carlow and Portage soils along the Mississippi River formed in material washed largely from acid glacial deposits and are relatively infertile and acid in reaction. The parent

material also reflects the varying speeds of the flowing water that carried it. Where the rivers overflowed, sandy materials were depostied first while the stream had sufficient flow and velocity to carry sand particles. Hodge soils, for example, formed along the main channel in fast-water deposits. By contrast, backswamp positions, where the lighter weight sediments were deposited by still water, produced soils that are high in clay content, such as Booker soils.

Local streams and drains that flow from the uplands have carried and deposited materials on smaller flood plains. Dockery and Haymond soils are typical of soils formed in these deposits. They are high in silt from the surrounding loess-capped uplands. Dupo soils formed in alluvial deposits from two sources. The silty upper part formed in recent deposits washed from the adjoining loess-covered uplands, and the lower part formed in clayey deposits on the Mississippi River flood plain.

plant and animal life

In addition to the mineral matter provided by parent material, another important soil component is organic matter. Plants, animals, insects, bacteria, and fungi are important in the formation of soils, and their decomposed residue makes up the organic fraction. Plants remove chemicals from the soil within reach of their roots and translocate them to growing parts above the soil. Leaves and other plant parts later return to the soil to decay and add nutrients and organic matter. The roots loosen soil aggregates, and when roots decay they leave channels for water and air movement.

The kind of native vegetation—prairie grasses versus forest trees—has most profoundly influenced soil formation in St. Charles County. Prairie grasses and deciduous trees have marked differences in rooting habits, lifespan, and mineral composition, and there are significant differences in the micro-organisms and animals associated with each.

The organic matter added to soils under forest cover is mostly in the form of leaves, twigs, and logs, which decompose at the soil surface. These materials tend to be acid in reaction. They cause forest soils to form a very thin, dark-colored surface layer and a leached subsurface layer.

In contrast, the organic matter added to soils under prairie grasses is largely the residuum from the yearly death and decay of annual and biennial plants. Plant tops decompose on the surface, but much of the organic material is in the soil in the form of roots. The materials thus added tend to be richer in mineral composition than forest residue. As a result, soils that formed under prairie grasses have a much thicker, dark-colored surface layer and tend to be less acid than soils that formed under forest.

Worms, insects, burrowing animals, large animals, and man affect and disturb the soil. Bacteria and fungi, however, contribute more toward the formation of soils than do animals. Bacteria and fungi cause rotting of organic materials, improve tilth, and fix nitrogen in the soils. The population of soil organisms is directly related to the rate of decomposition of organic material in the soil. The kinds of organisms in a given area and their activity are determined by differences in the vegetation.

The activities of man have, in a remarkably short time, had a profound effect on soil formation in St. Charles County. The major alterations result from changes in vegetation, drainage, relief, and accelerated erosion. The prairie grasses are replaced by row crops. Nearly all of the flood plains and many upland areas are cleared and farmed. Chemicals are used to fertilize desirable plants and to control unwanted plants and insects. Wet soils are drained, sloping soils are terraced, and lime is applied to acid soils. A new cycle of soil formation begins where huge earthmoving equipment completely alters and rearranges soil profiles in the process of urban and suburban development. Many of these changes help to bring about increased production of food and fiber and a higher standard of living. But in terms of sustained productivity, the net result of man's activities on soil formation is adverse. Accelerated erosion on upland soils continues to reduce the potential of many soils, but man has the capacity to reverse this trend. The loss of cropland to urban development, however, is virtually irreversible.

climate

Climate is an important factor in the formation of the soils in St. Charles County. The effect of rainfall and temperature on soil formation continues to the present. The rate of geologic erosion varies with the climate and influences the shape and character of the landforms that make up an area. Changes in the relative abundance and species composition of plant and animal life are directed by climatic change. Present climatic conditions favor the growth of trees at the expense of prairie grasses. The prairie region in St. Charles County may be a relic of a more arid climatic cycle, but the reason for its persistence until the time of settlement is not understood.

Changes in climate caused the glacial periods. Thousands of years of cool temperatures resulted in the massive glaciers that moved into the area many years ago. Warmer temperatures later resulted in severe geologic erosion and the blowing of the loess that covered most of St. Charles County at one time. Extreme changes in climate occurred very slowly; therefore, there were long intermediate periods when different types of vegetation grew. Soils formed on the surface and were later covered by loess, truncated, and mixed by erosion or completely washed away. The Keswick and Lindley soils are examples of soils that formed mostly in these old truncated or weathered soils.

Higher temperatures and rainfall encourage rapid chemical change and physical disintegration of the soil.

When calcium carbonate and other soluble salts are removed by leaching, soil fertility declines. This climate is also conducive to the rapid breakdown of minerals that forms clay within the soil. The clay is moved downward within the soil profile into the subsoil. This process is known as eluviation. Nearly all soils in the uplands show these effects. Climate has greatly influenced the nature and degree of weathering in the soils of St. Charles County.

relief

Relief, or topography, refers to the lay of the land. It is closely related to patterns and forces of deposition and soil formation. Relief is characterized by gradient (degree or percent of slope) and by the length, shape, aspect, and uniformity of slopes that make up a landscape. It is an important factor in determining the pattern and distribution of soils on a landscape because of its influence on drainage, runoff, and erosion.

Relief varies greatly in St. Charles County, ranging from a gently sloping to moderately sloping prairie region to very steep hillsides and vertical cliffs of the dissected areas. Other things being equal, more water enters the nearly level soils than the more sloping soils. This intensifies leaching, translocation of clay, and other soil-forming processes. Over long periods of time, a subsoil high in content of clay forms under a bleached subsurface layer. Marion and Twomile soils show this result.

At the other extreme are very steep soils. Runoff from them is excessive, and the rate of soil formation is slowed. Removal of weathering products by geologic erosion almost keeps pace with their accumulation through weathering. Gasconade and Gatewood soils formed under these conditions.

time

Time is necessary for the various processes of soil formation to act upon parent material to form soil. The time involved may be very short or very long, and the soils of St. Charles County show a wide range in age.

Perhaps the time factor is best described by considering the extremes. At one extreme we have very young soils that formed in alluvium deposited by floodwaters receding from the Missouri River flood plain. These are the youngest soils of the area; some are only a few years old. Hodge, Carr, Haynie, and Blake soils on the river side of the levees are examples of these soils.

At the other extreme are the soils that formed in loess and glacial till on nearly level to gently sloping topography at the highest elevations in the county. The oldest soils, Marion and Mexico soils for example, show maximum development of distinct horizons. The carbonates originally present in their parent material have been leached to a great depth, leaving them quite acid throughout. Clay has been concentrated in distinct subsoil horizons, both by formation through weathering and through translocation by water. A bleached subsurface horizon is formed where there is a perched water table above a relatively impervious subsoil.

Most soils in St. Charles County are intermediate in age. Freeburg soils on stream terraces are acid in reaction and have a clay-enriched subsoil. They formed in the same kind of alluvium as the young Haymond soils on the adjacent stream bottoms but in materials that have been in place longer.

The steep, shallow Gasconade soils are somewhat different. The limestone and shale from which their parent materials formed are far older than the oldest soil in the area. But because the removal of soil-forming materials by geologic erosion almost keeps pace with their accumulation through weathering, these soils are considered young.

The age of a soil, as expressed in profile characteristics, is not necessarily a reflection of time in years, but is rather a result of the interaction of various soil-forming factors over periods of time. Time, or age, is influenced by topography and climate. Age is determined by the degree of development of a given soil profile and not by the years that the soil material has existed.

references

(1) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(2) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(3) Cohrane, Paul V., 1969. History of St. Charles, Montgomery, and Warren Counties, Missouri, 1131 pp.

(4) Department of Natural Resources, Division of Parks and Recreation. 1976. Missouri statewide comprehensive outdoor recreation plan (SCORP)

(5) Drummond, Malcolm C. 1976. Historic sites in St. Charles County, Missouri. illus.

(6) Gasner, David A. and Burton L. Essex. 1966. Timber resources of Missouri's riverborder region. Univ. of Mo., Columbia, Mo. Agric. Exper. Stn. B-846, 73 pp.

(7) Livingston, Stephen D. 1976. The agricultural history of St. Charles County. Goellner Printing, 113 pp., illus.

(8) Missouri Bureau of Outdoor Recreation. 1974. NACD nationwide outdoor recreation inventory-Missouri

(9) Missouri Department of Natural Resources, Division of Research and Technical Information, Geological Survey. 1974. Geologic map of Missouri

(10) Missouri Division of Commerce and Industrial Development. 1977. St. Charles County, Missouri community profile

(11) Missouri Geological Survey, Department of Natural Resources. 1975. The resources of St. Charles County, Missouri—land, water, and minerals.

(12) Missouri State Soil and Water Conservation Needs Inventory Committee. 1970. Missouri conservation needs inventory.

(13) Nagel, Werner. 1970. Conservation contrasts. Mo. Dept. of Conserv., 453 pp., illus.

(14) State Inter-Agency Council for Outdoor Recreation. 1970. Missouri statewide comprehensive outdoor recreation plan (SCORP)

(15) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

(16) United States Department of Agriculture. 1956. Soil survey of St. Charles County, Missouri. Soil Conserv. Serv. 49 pp., illus.

(17) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.

(18) United States Department of Agriculture. 1975. Timber resources of Missouri's riverborder region '72. Forest Serv. North Central Forest Exp. Stn., St. Paul, Minn. 74 pp.

(19) United States Department of Agriculture. 1974. Forest area in Missouri Counties, 1972. Forest Serv. Research Note NC-182.

(20) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(21) United States Department of Commerce. 1976. 1974 Census of Agriculture. Bureau of Conservation. AG 74-P-29-183.

glossary

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and

does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly

restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, and clay.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the

soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low density housing. Less than one dwelling per acre.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces

on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-76 at Lambert Airport, St. Louis County, Missouri]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	39.0	21.0	30.0	71	-7	0	1.73	.71	2.55	4	4.3
February---	44.2	25.6	34.9	74	0	9	2.19	.89	3.24	5	3.9
March------	53.4	32.9	43.2	85	10	68	3.00	1.82	4.04	7	4.6
April------	67.0	45.1	56.1	90	25	210	3.59	2.03	4.86	8	.4
May--------	76.2	54.6	65.4	93	34	482	3.67	2.00	5.03	7	.0
June-------	85.2	64.3	74.8	98	48	744	3.85	1.67	5.62	7	.0
July-------	88.8	68.5	78.7	101	53	890	3.51	1.68	5.00	6	.0
August-----	87.3	66.4	76.9	101	52	834	2.52	.96	3.77	5	.0
September--	80.3	58.5	69.4	97	40	582	2.73	1.20	3.97	6	.0
October----	69.1	47.1	58.2	89	28	282	2.27	.89	3.37	5	.0
November---	53.8	35.0	44.4	78	12	33	2.45	1.09	3.55	5	1.6
December---	42.4	25.8	34.1	72	-1	11	2.30	.76	3.52	6	3.0
Yearly:											
Average--	65.6	45.4	55.5	---	---	---	---	---	---	---	---
Extreme--	---	---	---	104	-8	---	---	---	---	---	---
Total----	---	---	---	---	---	4,145	33.81	28.12	39.25	71	17.8

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-76 at Lambert Airport, St. Louis County, Missouri]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 7	April 12	April 25
2 years in 10 later than--	April 1	April 8	April 20
5 years in 10 later than--	March 22	March 31	April 11
First freezing temperature in fall:			
1 year in 10 earlier than--	November 1	October 23	October 12
2 years in 10 earlier than--	November 6	October 28	October 17
5 years in 10 earlier than--	November 14	November 5	October 27

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-76 at Lambert Airport, St. Louis County, Missouri]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	217	200	176
8 years in 10	223	206	184
5 years in 10	236	219	198
2 years in 10	249	231	213
1 year in 10	256	237	220

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
2D	Goss silt loam, 5 to 14 percent slopes	1,505	0.4
2F	Goss cherty silt loam, 14 to 35 percent slopes	13,369	3.6
3	Twomile silt loam	1,214	0.3
4D	Menfro-Goss silt loams, 9 to 14 percent slopes	926	0.2
6C	Crider silt loam, 5 to 9 percent slopes	981	0.3
6D2	Crider silt loam, 9 to 14 percent slopes, eroded	6,503	1.7
6E	Crider silt loam, 14 to 20 percent slopes	3,484	0.9
7B	Menfro silt loam, 2 to 5 percent slopes	536	0.1
7C	Menfro silt loam, 5 to 9 percent slopes	14,966	4.0
7D2	Menfro silt loam, 9 to 14 percent slopes, eroded	10,719	2.9
7E2	Menfro silt loam, 14 to 20 percent slopes, eroded	4,574	1.2
7F	Menfro silt loam, 20 to 30 percent slopes	5,708	1.5
8C	Winfield silt loam, 5 to 9 percent slopes	849	0.2
8D	Winfield silt loam, 9 to 14 percent slopes	8,936	2.4
8E2	Winfield silty clay loam, 14 to 20 percent slopes, eroded	2,012	0.5
9E	Holstein loam, 14 to 35 percent slopes	807	0.2
10F	Gasconade-Rock outcrop complex, 15 to 50 percent slopes	1,889	0.5
11	Dockery silt loam	15,621	4.2
12	Kennebec silt loam	1,579	0.4
13	Auxvasse silt loam	924	0.2
22F	Gatewood-Gasconade-Crider complex, 15 to 50 percent slopes	22,053	5.9
24D2	Keswick silt loam, 9 to 14 percent slopes, eroded	11,132	3.0
27C	Armster silt loam, 5 to 9 percent slopes	22,688	6.0
31C	Hatton silt loam, 5 to 9 percent slopes	12,945	3.5
34E	Lindley loam, 14 to 20 percent slopes	1,125	0.3
35B	Mexico silt loam, 1 to 5 percent slopes	14,452	3.9
37	Marion silt loam	175	*
40	Westerville silt loam	1,427	0.4
41	Freeburg silt loam	279	0.1
43	Cedargap silt loam	621	0.2
44	Sensabaugh silt loam	4,475	1.2
48A	Weller silt loam, 0 to 2 percent slopes	809	0.2
48B	Weller silt loam, 2 to 5 percent slopes	7,431	2.0
48C	Weller silt loam, 5 to 9 percent slopes	13,373	3.6
54C	Harvester-Urban land complex, 2 to 9 percent slopes	15,335	4.1
54D	Harvester-Urban land complex, 9 to 14 percent slopes	3,549	0.9
62	Edinburg silty clay loam	317	0.1
63B	Herrick silt loam, 2 to 5 percent slopes	3,911	1.0
67E	Menfro silt loam, karst, 5 to 20 percent slopes	907	0.2
70	Booker clay	5,504	1.5
71	Waldron silty clay	10,650	2.8
72	Blake silty clay loam	12,561	3.3
73	Haynie silt loam	13,460	3.6
74	Carr fine sandy loam	5,904	1.6
75	Hodge loamy fine sand	4,885	1.3
76	Haynie-Blake complex	3,650	1.0
77	Hodge-Blake complex	1,908	0.5
79	Dupo silt loam	1,839	0.5
80	Portage clay	18,087	4.8
81	Haymond silt loam	6,082	1.6
82	Chequest silt loam	3,384	0.9
83	Lomax loam	6,356	1.7
84	Blase silty clay loam	4,440	1.2
85	Carlow silty clay loam	17,642	4.8
86	Kampville silt loam	5,194	1.4
90	Hurst silt loam	4,556	1.2
91	Pits, quarries	525	0.1
	Water	14,307	3.9
	Total	375,040	100.0

* Less than 0.1 percent.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Smooth bromegrass
	Bu	Bu	Bu	Bu	Ton	AUM*
2D------------------------ Goss	---	---	---	---	1.2	3.4
2F------------------------ Goss	---	---	---	---	---	---
3------------------------- Twomile	70	25	28	60	3.0	6.0
4D------------------------ Menfro-Goss	---	---	---	---	2.0	4.0
6C------------------------ Crider	84	31	48	70	3.2	6.4
6D2----------------------- Crider	74	28	45	74	3.0	6.8
6E------------------------ Crider	63	25	---	---	3.0	6.0
7B------------------------ Menfro	92	35	50	90	4.0	8.0
7C------------------------ Menfro	84	31	48	84	3.7	7.4
7D2----------------------- Menfro	74	28	45	74	3.4	6.8
7E2----------------------- Menfro	63	25	38	65	3.0	6.0
7F------------------------ Menfro	---	---	---	---	---	5.4
8C------------------------ Winfield	80	30	45	80	4.1	8.2
8D------------------------ Winfield	72	26	40	72	3.4	6.8
8E2----------------------- Winfield	60	23	35	60	3.0	6.0
9E------------------------ Holstein	---	---	---	---	2.5	5.0
10F----------------------- Gasconade-Rock outcrop	---	---	---	---	---	---
11------------------------ Dockery	125	48	42	100	5.0	8.0
12------------------------ Kennebec	121	46	47	110	5.1	7.1
13------------------------ Auxvasse	85	31	35	52	3.7	6.0
22F----------------------- Gatewood-Gasconade-Crider	---	---	---	---	---	---
24D2---------------------- Keswick	44	17	30	45	2.2	4.1

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Smooth bromegrass
	Bu	Bu	Bu	Bu	Ton	AUM*
27C Armster	62	22	30	65	3.2	6.5
31C Hatton	74	29	32	65	3.4	6.4
34E Lindley	---	---	---	---	2.2	4.4
35B Mexico	90	40	49	90	3.5	7.0
37 Marion	65	25	27	55	3.0	6.0
40 Westerville	90	35	40	80	4.5	8.0
41 Freeburg	92	35	40	80	4.0	8.0
43 Cedargap	40	18	25	45	3.0	6.0
44 Sensabaugh	75	28	45	75	3.3	6.6
48A Weller	90	37	45	71	4.0	6.9
48B Weller	85	36	45	68	4.0	5.6
48C Weller	75	34	42	65	3.8	5.4
54C Harvester-Urban land	---	---	---	---	---	---
54D Harvester-Urban land	---	---	---	---	---	---
62 Edinburg	120	43	55	90	4.6	8.5
63B Herrick	110	45	60	85	5.4	---
67E Menfro	64	28	38	60	3.0	6.0
70 Booker	55	30	28	60	2.5	4.5
71 Waldron	80	35	40	68	3.6	7.0
72 Blake	115	44	48	95	4.4	7.8
73 Haynie	110	44	45	98	5.0	8.2
74 Carr	75	34	40	80	4.0	7.0
75 Hodge	38	14	25	44	1.7	3.4

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grain sorghum	Grass-legume hay	Smooth bromegrass
	Bu	Bu	Bu	Bu	Ton	AUM*
76----------------------- Haynie-Blake	105	40	40	83	3.7	5.5
77----------------------- Hodge-Blake	30	14	---	35	2.5	4.1
79----------------------- Dupo	112	43	46	90	4.3	8.0
80----------------------- Portage	60	35	30	60	2.5	4.5
81----------------------- Haymond	110	45	50	95	5.0	9.0
82----------------------- Chequest	98	37	40	75	3.9	5.3
83----------------------- Lomax	130	45	50	95	5.1	9.5
84----------------------- Blase	100	45	50	80	4.7	8.2
85----------------------- Carlow	72	38	30	61	3.3	---
86----------------------- Kampville	110	45	50	---	---	---
90----------------------- Hurst	75	28	40	75	3.6	7.0
91**. Pits						

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	22,846	---	---	---
II	95,445	18,899	70,021	6,525
III	154,911	100,761	48,102	6,048
IV	24,730	24,730	---	---
V	---	---	---	---
VI	9,608	7,640	---	1,968
VII	35,184	---	---	35,184
VIII	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
2D: Goss	4f	Slight	Moderate	Slight	Slight	White oak	60	Sweetgum, yellow-poplar, green ash.
						Shortleaf pine	---	
						Post oak	---	
						Blackjack oak	---	
						Black oak	---	
2F: Goss	4f	Slight	Severe	Moderate	Slight	White oak	60	Sweetgum, yellow-poplar, green ash.
						Shortleaf pine	---	
						Post oak	---	
						Blackjack oak	---	
						Black oak	---	
3: Twomile	3w	Slight	Severe	Moderate	Moderate	Pin oak	80	Pin oak, eastern cottonwood, pecan, silver maple, green ash, black willow, sweetgum.
4D*:								
Menfro	3o	Slight	Slight	Slight	Slight	White oak	65	Shortleaf pine, green ash, black walnut, yellow-poplar, white oak, eastern white pine, sugar maple.
						Northern red oak	75	
						Black oak	73	
						White ash	70	
						Sugar maple	68	
Goss	4f	Slight	Moderate	Slight	Slight	White oak	60	Sweetgum, yellow-poplar, green ash.
						Shortleaf pine	---	
						Post oak	---	
						Blackjack oak	---	
						Black oak	---	
6C, 6D2: Crider	3o	Slight	Slight	Slight	Slight	Northern red oak	70	Eastern white pine, yellow-poplar, black walnut, white ash.
						Yellow-poplar	---	
						Virginia pine	---	
						Shortleaf pine	---	
6E: Crider	3r	Moderate	Moderate	Slight	Slight	Northern red oak	70	Eastern white pine, yellow-poplar, black walnut, white ash.
						Yellow-poplar	---	
						Virginia pine	---	
						Shortleaf pine	---	
7B, 7C, 7D2: Menfro	3o	Slight	Slight	Slight	Slight	White oak	65	Shortleaf pine, green ash, black walnut, yellow-poplar, white oak, eastern white pine, sugar maple.
						Northern red oak	75	
						Black oak	73	
						White ash	70	
						Sugar maple	68	
7E2, 7F: Menfro	3r	Moderate	Moderate	Moderate	Slight	White oak	65	Shortleaf pine, green ash, black walnut, yellow-poplar, white oak, eastern white pine, sugar maple.
						Northern red oak	75	
						Black oak	73	
						White ash	70	
						Sugar maple	68	
8C, 8D: Winfield	3o	Slight	Slight	Slight	Slight	White oak	65	Eastern white pine, green ash, yellow-poplar, northern red oak, black oak.
						Northern red oak	60	
						Black oak	65	
8E2: Winfield	3r	Moderate	Moderate	Moderate	Slight	White oak	65	Eastern white pine, green ash, yellow-poplar, northern red oak, black oak.
						Northern red oak	60	
						Black oak	65	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
9E----------------- Holstein	3r	Moderate	Moderate	Moderate	Slight	White oak----------- Northern red oak---- Black oak-----------	65 --- ---	Shortleaf pine, green ash, black walnut, yellow-poplar, black cherry, northern red oak, black oak, white oak.
10F*:								
Gasconade---------	5d	Slight	Severe	Moderate	Moderate	Eastern redcedar---- Chinkapin oak------- White ash----------- Sugar maple--------- Mockernut hickory--- Post oak------------ Blackjack oak-------	30 --- --- --- --- --- ---	Eastern redcedar, shortleaf pine.
Rock outcrop.								
11----------------- Dockery	3o	Slight	Slight	Slight	Slight	Pin oak-------------	76	Pin oak, pecan, eastern cottonwood.
12----------------- Kennebec	2o	Slight	Slight	Slight	Slight	Black walnut-------- Bur oak------------- Common hackberry---- Green ash----------- Eastern cottonwood--	79 63 --- --- ---	Black walnut, bur oak, common hackberry, green ash, eastern cottonwood, American sycamore.
13----------------- Auxvasse	4w	Slight	Severe	Moderate	Moderate	Pin oak------------- Northern red oak---- Silver maple-------- Green ash----------- American sycamore--- Shumard oak---------	76 --- --- --- --- ---	Pin oak, white oak, green ash, eastern cottonwood, silver maple, sweetgum.
22F*:								
Gatewood----------	5c	Moderate	Moderate	Severe	Severe	White oak----------- Eastern redcedar---- Post oak------------ Black oak-----------	45 --- --- ---	Shortleaf pine.
Gasconade---------	5d	Slight	Severe	Moderate	Moderate	Eastern redcedar---- Chinkapin oak------- White ash----------- Sugar maple--------- Mockernut hickory--- Post oak------------ Blackjack oak-------	30 --- --- --- --- --- ---	Eastern redcedar, shortleaf pine.
Crider------------	3r	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Virginia pine------- Shortleaf pine------	78 97 78 80	Eastern white pine, yellow-poplar, black walnut, white ash.
24D2--------------- Keswick	4c	Slight	Slight	Slight	Moderate	White oak----------- Northern red oak----	55 55	Eastern white pine, red pine, sugar maple, northern red oak, black oak.
27C---------------- Armster	4o	Slight	Slight	Slight	Slight	Pin oak-------------	70	Pin oak, green ash, black walnut, eastern redcedar, red pine, black oak.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
31C----------------- Hatton	4c	Slight	Slight	Moderate	Moderate	White oak-----------	56	White oak, black oak, bur oak, scarlet oak, white ash.
34E----------------- Lindley	4c	Moderate	Moderate	Slight	Slight	White oak-----------	60	White oak, green ash, yellow-poplar, black oak.
						Post oak------------	---	
						Blackjack oak-------	---	
						Black oak-----------	---	
						White oak-----------	---	
						Post oak------------	---	
35B----------------- Mexico	4c	Slight	Slight	Moderate	Moderate	White oak-----------	54	White oak, pin oak, green ash, yellow-poplar, black oak, bur oak.
37------------------ Marion	5w	Slight	Severe	Moderate	Moderate	White oak-----------	50	White oak, pin oak, green ash, eastern cottonwood, silver maple.
40------------------ Westerville	2o	Slight	Slight	Slight	Slight	Pin oak-------------	90	Pin oak, eastern cottonwood, green ash, pecan.
						Eastern cottonwood--	100	
41------------------ Freeburg	3o	Slight	Slight	Slight	Slight	White oak-----------	65	White oak, pin oak, green ash, eastern cottonwood, yellow-poplar, black oak, pecan.
43------------------ Cedargap	3f	Slight	Slight	Moderate	Slight	Black oak-----------	66	Black oak, shortleaf pine.
44------------------ Sensabaugh	2o	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Yellow-poplar, black walnut.
						White oak-----------	80	
						Shortleaf pine------	80	
						Virginia pine-------	75	
48A, 48B, 48C------ Weller	4c	Slight	Slight	Severe	Severe	White oak-----------	55	Eastern white pine, red pine, black walnut, sugar maple.
62------------------ Edinburg	---	--------	--------	--------	--------	--------------------	---	Green ash, pin oak.
63B----------------- Herrick	---	--------	--------	--------	--------	--------------------	---	Eastern white pine, American sycamore, eastern cottonwood, green ash, northern red oak, sweetgum, white oak.
67E----------------- Menfro	3o	Slight	Slight	Slight	Slight	White oak-----------	65	Shortleaf pine, green ash, black walnut, yellow-poplar, white oak, eastern white pine, sugar maple.
						Northern red oak----	75	
						Black oak-----------	73	
						White ash-----------	70	
						Sugar maple---------	68	
70------------------ Booker	4w	Slight	Severe	Severe	Severe	Eastern cottonwood--	85	Eastern cottonwood, pin oak, pecan, green ash, sweetgum, willow oak, silver maple.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
71----------------- Waldron	2c	Slight	Moderate	Severe	Slight	Eastern cottonwood-- Pin oak-------------	110 ---	Pin oak, pecan, eastern cottonwood, green ash, silver maple, sweetgum.
72----------------- Blake	---	--------	--------	--------	--------	-------------------	-----	Eastern cottonwood, green ash, silver maple, American sycamore.
73----------------- Haynie	2o	Slight	Slight	Slight	Slight	Eastern cottonwood-- American sycamore--- Black walnut-------- Green ash-----------	100 110 --- ---	Black walnut, eastern cottonwood.
74----------------- Carr	3o	Slight	Slight	Slight	Slight	Eastern cottonwood-- American sycamore---	90 ---	Eastern cottonwood, American sycamore.
75----------------- Hodge	1s	Slight	Slight	Moderate	Slight	Eastern cottonwood--	110	Eastern cottonwood, black willow, red pine white oak, white ash, silver maple.
76*:								
Haynie------------	2o	Slight	Slight	Slight	Slight	Eastern cottonwood-- American sycamore--- Black walnut-------- Green ash-----------	110 110 --- ---	Black walnut, eastern cottonwood.
Blake-------------	1o	Slight	Slight	Slight	Slight	Eastern cottonwood-- Silver maple--------	110 100	Eastern cottonwood, silver maple, American sycamore.
77*:								
Hodge-------------	1s	Slight	Slight	Moderate	Slight	Eastern cottonwood--	110	Eastern cottonwood, black willow, red pine, white oak, white ash, silver maple.
Blake-------------	1o	Slight	Slight	Slight	Slight	Eastern cottonwood-- Silver maple--------	110 100	Eastern cottonwood, silver maple, American sycamore.
79----------------- Dupo	---	--------	--------	--------	--------	-------------------	---	American sycamore, eastern cottonwood, green ash, yellow-poplar, red maple.
80----------------- Portage	4w	Slight	Severe	Severe	Severe	Eastern cottonwood-- Silver maple--------	85 ---	Eastern cottonwood, pin oak, pecan, green ash, sweetgum, silver maple.
81----------------- Haymond	1o	Slight	Slight	Slight	Slight	Yellow-poplar------- White oak----------- Black walnut--------	100 90 70	Eastern white pine, black walnut, yellow-poplar, eastern cottonwood.
82----------------- Chequest	3w	Slight	Severe	Moderate	Moderate	Eastern cottonwood-- Silver maple--------	90 80	Eastern cottonwood, silver maple, American sycamore, green ash.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
83----------------- Lomax	---	--------	--------	--------	--------	--------------------	---	Black walnut, American sycamore, eastern cottonwood, green ash, bur oak, eastern white pine.
84----------------- Blase	3c	Slight	Moderate	Severe	Slight	Eastern cottonwood-- Silver maple-------- Green ash-----------	90 --- ---	Eastern cottonwood, silver maple.
85----------------- Carlow	4w	Slight	Severe	Severe	Moderate	Eastern cottonwood-- Pin oak-------------	85 75	Eastern cottonwood, pin oak, pecan, green ash, sweetgum, willow oak, silver maple.
86----------------- Kampville	2o	Slight	Slight	Slight	Slight	Eastern cottonwood--	100	Eastern cottonwood, pin oak, green ash.
90----------------- Hurst	3o	Slight	Slight	Slight	Slight	White oak----------- Southern red oak---- White ash----------- Bur oak-------------	70 70 --- ---	Shortleaf pine, eastern white pine.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
2D, 2F----------- Goss	Siberian peashrub	Lilac, Amur honeysuckle, autumn-olive, Tatarian honeysuckle, eastern redcedar, Washington hawthorn, radiant crabapple.	Eastern white pine, jack pine, red pine, Austrian pine.	---	---
3---------------- Twomile	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Norway spruce, Austrian pine.	Eastern white pine	Pin oak.
4D*:					
Menfro-----------	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Goss-------------	Siberian peashrub	Lilac, Amur honeysuckle, autumn-olive, Tatarian honeysuckle, eastern redcedar, Washington hawthorn, radiant crabapple.	Eastern white pine, jack pine, red pine, Austrian pine.	---	---
6C, 6D2, 6E------- Crider	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
7B, 7C, 7D2, 7E2, 7F--------------- Menfro	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
8C, 8D, 8E2------- Winfield	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	Northern white-cedar, blue spruce, white fir, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
9E---------------- Holstein	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	White fir, Washington hawthorn, northern white-cedar, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
10F*:					
Gasconade.					
Rock outcrop.					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
11 Dockery	---	Silky dogwood, Amur honeysuckle, American cranberrybush, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce	Eastern white pine, pin oak.
12 Kennebec	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
13 Auxvasse	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Austrian pine, northern white-cedar, white fir, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
22F*:					
Gatewood	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Gasconade					
Crider	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
24D2 Keswick	---	Eastern redcedar, Tatarian honeysuckle, Washington hawthorn, arrowwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
27C Armster	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
31C Hatton	---	Amur honeysuckle, American cranberrybush, eastern redcedar, Amur privet, arrowwood, Tatarian honeysuckle, Washington hawthorn.	Austrian pine, osageorange, green ash.	Eastern white pine, pin oak.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
34E-------------- Lindley	---	Silky dogwood, Amur honeysuckle, Amur privet.	American cranberrybush, Washington hawthorn, northern white-cedar, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
35B-------------- Mexico	---	Amur honeysuckle, American cranberrybush, Tatarian honeysuckle, arrowwood, eastern redcedar, Amur privet, Washington hawthorn.	Green ash, osageorange, Austrian pine.	Eastern white pine, pin oak.	---
37--------------- Marion	---	Amur honeysuckle, Tatarian honeysuckle, Amur privet, eastern redcedar, Washington hawthorn, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Eastern white pine, pin oak.	---
40--------------- Westerville	---	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	Austrian pine, white fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce-----	Pin oak, eastern white pine.
41--------------- Freeburg	---	American cranberrybush, Amur honeysuckle, silky dogwood, Amur privet.	Northern white-cedar, white fir, blue spruce, Washington hawthorn, Austrian pine.	Norway spruce-----	Eastern white pine, pin oak.
43--------------- Cedargap	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, northern white-cedar, white fir, Washington hawthorn, blue spruce.	Norway spruce-----	Eastern white pine, pin oak.
44--------------- Sensabaugh	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
48A, 48B, 48C----- Weller	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Washington hawthorn, Amur privet, eastern redcedar.	Osageorange, green ash, Austrian pine.	Pin oak, eastern white pine.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
54C*, 54D*:					
Harvester	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
Urban land.					
62 Edinburg	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
63B Herrick	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
67E Menfro	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Washington hawthorn, blue spruce, white fir.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
70 Booker	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
71 Waldron	---	Siberian peashrub, Tatarian honeysuckle.	Washington hawthorn, nannyberry viburnum, eastern redcedar, white spruce, northern white-cedar, green ash, osageorange.	Black willow	Eastern cottonwood.
72 Blake	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow	Eastern cottonwood.
73 Haynie	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, northern white-cedar, white spruce, Washington hawthorn, nannyberry viburnum, eastern redcedar.	Black willow	Eastern cottonwood.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
74 Carr	---	Tatarian honeysuckle, Siberian peashrub.	Osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow, green ash.	Eastern cottonwood.
75 Hodge	---	Tatarian honeysuckle, Siberian peashrub.	Osageorange, northern white-cedar, eastern redcedar, nannyberry viburnum, green ash, white spruce, Washington hawthorn.	Black willow	Eastern cottonwood.
76*:					
Haynie	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, northern white-cedar, white spruce, Washington hawthorn, nannyberry viburnum, eastern redcedar.	Black willow	Eastern cottonwood.
Blake	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow	Eastern cottonwood.
77*:					
Hodge	---	Tatarian honeysuckle, Siberian peashrub.	Osageorange, northern white-cedar, eastern redcedar, nannyberry viburnum, green ash, white spruce, Washington hawthorn.	Black willow	Eastern cottonwood.
Blake	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, osageorange, eastern redcedar, northern white-cedar, white spruce, nannyberry viburnum, Washington hawthorn.	Black willow	Eastern cottonwood.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
79----------------- Dupo	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
80----------------- Portage	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Austrian pine, Washington hawthorn, northern white-cedar, blue spruce, Norway spruce, white fir.	Eastern white pine	Pin oak.
81----------------- Haymond	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
82----------------- Chequest	---	Amur privet, silky dogwood, Amur honeysuckle, American cranberrybush.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
83----------------- Lomax	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, eastern redcedar, northern white-cedar, osageorange.	Eastern white pine, Norway spruce, red pine.	---
84----------------- Blase	---	Amur privet, Washington hawthorn, eastern redcedar, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
85----------------- Carlow	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
86----------------- Kampville	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
90 Hurst	---	Washington hawthorn, Amur privet, arrowwood, Tatarian honeysuckle, Amur honeysuckle, eastern redcedar, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
91*. Pits					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
2D Goss	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Severe: droughty.
2F Goss	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: droughty, slope.
3 Twomile	Severe: floods, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
4D*:					
Menfro	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Goss	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Severe: droughty.
6C Crider	Slight	Slight	Severe: slope.	Slight	Slight.
6D2 Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
6E Crider	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
7B Menfro	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
7C Menfro	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
7D2 Menfro	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
7E2 Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
7F Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
8C Winfield	Slight	Slight	Severe: slope.	Severe: erodes easily.	Slight.
8D Winfield	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
8E2 Winfield	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
9E Holstein	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
10F*:					
Gasconade	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
10F*:					
Rock outcrop.					
11 Dockery	Severe: floods, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, floods.
12 Kennebec	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
13 Auxvasse	Severe: floods, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
22F*:					
Gatewood	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Gasconade	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Crider	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
24D2 Keswick	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
27C Armster	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
31C Hatton	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Slight.
34E Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
35B Mexico	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
37 Marion	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
40 Westerville	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.
41 Freeburg	Severe: floods.	Moderate: wetness, percs slowly.	Moderate: wetness.	Severe: erodes easily.	Moderate: wetness.
43 Cedargap	Severe: floods.	Slight	Moderate: small stones, floods.	Slight	Moderate: floods.
44 Sensabaugh	Severe: floods.	Slight	Moderate: small stones.	Slight	Moderate: floods.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
48A Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: erodes easily.	Slight.
48B Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
48C Weller	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
54C*:					
Harvester	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
Urban land.					
54D*:					
Harvester	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Urban land.					
62 Edinburg	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
63B Herrick	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
67E Menfro	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
70 Booker	Severe: floods, ponding, percs slowly.	Severe: ponding, too clayey, percs slowly.	Severe: too clayey, ponding, floods.	Severe: ponding, too clayey.	Severe: ponding, floods, too clayey.
71 Waldron	Severe: floods, wetness, too clayey.	Severe: too clayey.	Severe: too clayey, wetness.	Severe: too clayey.	Severe: too clayey.
72 Blake	Severe: floods.	Moderate: wetness.	Moderate: wetness.	Slight	Slight.
73 Haynie	Severe: floods.	Slight	Moderate: floods.	Slight	Slight.
74 Carr	Severe: floods.	Slight	Moderate: floods.	Slight	Slight.
75 Hodge	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
76*:					
Haynie	Severe: floods.	Slight	Moderate: slope, floods.	Slight	Moderate: floods.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
76*:					
Blake	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight	Moderate: floods.
77*:					
Hodge	Severe: floods.	Moderate: floods.	Severe: floods.	Moderate: floods.	Severe: floods.
Blake	Severe: floods.	Moderate: wetness.	Severe: wetness, floods.	Slight	Severe: floods.
79 Dupo	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: floods, wetness.	Moderate: wetness, floods.	Severe: floods.
80 Portage	Severe: floods, wetness, percs slowly.	Severe: wetness, too clayey, percs slowly.	Severe: too clayey, wetness, percs slowly.	Severe: wetness, too clayey, erodes easily.	Severe: wetness, too clayey.
81 Haymond	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
82 Chequest	Severe: wetness, floods.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.
83 Lomax	Severe: floods.	Slight	Moderate: small stones.	Slight	Slight.
84 Blase	Severe: floods.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
85 Carlow	Severe: floods, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, erodes easily.	Severe: wetness.
86 Kampville	Severe: floods, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness, floods.
90 Hurst	Severe: floods, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
91*. Pits					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
2D, 2F Goss	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
3 Twomile	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
4D*:										
Menfro	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Goss	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
6C Crider	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
6D2 Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
6E Crider	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
7B Menfro	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
7C, 7D2 Menfro	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
7E2 Menfro	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
7F Menfro	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
8C, 8D Winfield	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
8E2 Winfield	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
9E Holstein	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
10F*:										
Gasconade	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rock outcrop.										
11 Dockery	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
12 Kennebec	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
13 Auxvasse	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
22F*:										
Gatewood	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
22F*:										
Gasconade	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Crider	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
24D2 Keswick	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
27C Armster	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
31C Hatton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
34E Lindley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
35B Mexico	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
37 Marion	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
40 Westerville	Good	Good	Good	Good	Good	Fair	Fair	Good	Fair	Fair.
41 Freeburg	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
43 Cedargap	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
44 Sensabaugh	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
48A Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
48B Weller	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
48C Weller	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
54C*, 54D*:										
Harvester.										
Urban land.										
62 Edinburg	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
63B Herrick	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
67E Menfro	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
70 Booker	Poor	Poor	Fair	Poor	Poor	Poor	Good	Poor	Poor	Fair.
71 Waldron	Fair	Fair	Poor	Good	Good	Poor	Fair	Fair	Fair	Poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
72----------------- Blake	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
73----------------- Haynie	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
74----------------- Carr	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
75----------------- Hodge	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
76*:										
Haynie------------	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Blake-------------	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
77*:										
Hodge-------------	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Blake-------------	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.
79----------------- Dupo	Good	Good	Good	Good	Good	Fair	Good	Good	Good	Fair.
80----------------- Portage	Poor	Poor	Poor	Poor	Poor	Poor	Good	Very poor.	Very poor.	Poor.
81----------------- Haymond	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
82----------------- Chequest	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
83----------------- Lomax	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
84----------------- Blase	Fair	Good	Good	Good	Good	Good	Good	Good	Good	Good.
85----------------- Carlow	Poor	Poor	Fair	Fair	Fair	Poor	Good	Poor	Fair	Fair.
86----------------- Kampville	Fair	Good	Good	Good	Good	Good	Good	Good	Good	Good.
90----------------- Hurst	Fair	Good	Good	Good	Fair	Fair	Fair	Good	Good	Fair.
91*. Pits										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
2D-----Goss	Moderate: too clayey, large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Moderate: low strength, slope, frost action.	Severe: droughty.
2F-----Goss	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
3-----Twomile	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, frost action.	Moderate: wetness.
4D*:						
Menfro-----	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
Goss-----	Moderate: too clayey, large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Moderate: low strength, slope, frost action.	Severe: droughty.
6C-----Crider	Moderate: too clayey.	Slight-----	Slight-----	Moderate: slope.	Severe: low strength.	Slight.
6D2-----Crider	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
6E-----Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
7B-----Menfro	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
7C-----Menfro	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: frost action, low strength.	Slight.
7D2-----Menfro	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
7E2, 7F-----Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, low strength, slope.	Severe: slope.
8C-----Winfield	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
8D-----Winfield	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
8E2-----Winfield	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
9E----------------- Holstein	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
10F*:						
Gasconade--------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
11----------------- Dockery	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, floods, frost action.	Moderate: wetness, floods.
12----------------- Kennebec	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action, low strength.	Moderate: floods.
13----------------- Auxvasse	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness.	Severe: floods, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
22F*:						
Gatewood---------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Gasconade--------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Crider-----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
24D2-------------- Keswick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness, slope.
27C--------------- Armster	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
31C--------------- Hatton	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.
34E--------------- Lindley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
35B--------------- Mexico	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
37---------------- Marion	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
40---------------- Westerville	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: low strength, frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
41----------------- Freeburg	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, frost action.	Moderate: wetness.
43----------------- Cedargap	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
44----------------- Sensabaugh	Moderate: wetness, floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
48A, 48B, 48C------ Weller	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, wetness.	Severe: shrink-swell.	Severe: shrink-swell, frost action, low strength.	Slight.
54C*:						
Harvester---------	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
Urban land.						
54D*:						
Harvester---------	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Urban land.						
62----------------- Edinburg	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding.	Severe: ponding.
63B---------------- Herrick	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness.
67E---------------- Menfro	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
70----------------- Booker	Severe: ponding.	Severe: floods, ponding, shrink-swell.	Severe: floods, ponding, shrink-swell.	Severe: floods, ponding, shrink-swell.	Severe: low strength, ponding, floods.	Severe: ponding, floods, too clayey.
71----------------- Waldron	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, frost action.	Severe: too clayey.
72----------------- Blake	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action, low strength.	Slight.
73----------------- Haynie	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: frost action, low strength.	Slight.
74----------------- Carr	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Slight.
75----------------- Hodge	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Severe: floods.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
76*:						
Haynie-----------	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action, low strength.	Moderate: floods.
Blake------------	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action, floods, low strength.	Moderate: floods.
77*:						
Hodge------------	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.
Blake------------	Severe: wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: frost action, floods, low strength.	Severe: floods.
79---------------- Dupo	Severe: wetness, floods.	Severe: floods, shrink-swell, wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, shrink-swell, wetness.	Severe: floods, frost action, low strength.	Severe: floods.
80---------------- Portage	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: wetness, too clayey.
81---------------- Haymond	Moderate: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Moderate: floods.
82---------------- Chequest	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, low strength, frost action.	Moderate: wetness, floods.
83---------------- Lomax	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: frost action, floods.	Slight.
84---------------- Blase	Moderate: too clayey.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: floods, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Slight.
85---------------- Carlow	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, wetness, floods.	Severe: wetness.
86---------------- Kampville	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, floods, frost action.	Moderate: wetness, floods.
90---------------- Hurst	Severe: wetness.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: floods, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
91*. Pits						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
2D Goss	Moderate: percs slowly, slope, large stones.	Severe: seepage, slope.	Severe: too clayey, large stones.	Severe: seepage.	Poor: too clayey, small stones.
2F Goss	Severe: slope.	Severe: seepage, slope.	Severe: slope, too clayey, large stones.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
3 Twomile	Severe: wetness, percs slowly.	Severe: floods.	Severe: wetness.	Severe: wetness.	Poor: wetness.
4D*:					
Menfro	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
Goss	Moderate: percs slowly, slope, large stones.	Severe: seepage, slope.	Severe: too clayey, large stones.	Severe: seepage.	Poor: too clayey, small stones.
6C Crider	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
6D2 Crider	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
6E Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
7B Menfro	Slight	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
7C Menfro	Slight	Severe: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
7D2 Menfro	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
7E2, 7F Menfro	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
8C Winfield	Severe: wetness.	Severe: slope, wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
8D Winfield	Severe: wetness.	Severe: slope, wetness.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
8E2 Winfield	Severe: wetness, slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Poor: slope.
9E Holstein	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
10F*:					
Gasconade	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, large stones.
Rock outcrop.					
11 Dockery	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
12 Kennebec	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
13 Auxvasse	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
22F*:					
Gatewood	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Gasconade	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, large stones.
Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
24D2 Keswick	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
27C Armster	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
31C Hatton	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
34E Lindley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
35B Mexico	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
37 Marion	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
40 Westerville	Severe: wetness.	Severe: floods, wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
41 Freeburg	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness.	Moderate: floods, wetness.	Fair: too clayey, wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
43------------------ Cedargap	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage.	Severe: floods, seepage.	Poor: small stones.
44------------------ Sensabaugh	Severe: floods.	Severe: seepage, floods.	Severe: floods, seepage, wetness.	Severe: floods, seepage.	Poor: small stones.
48A----------------- Weller	Severe: percs slowly, wetness.	Slight-----------	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
48B----------------- Weller	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
48C----------------- Weller	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
54C*:					
Harvester----------	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
Urban land.					
54D*:					
Harvester----------	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Urban land.					
62------------------ Edinburg	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
63B----------------- Herrick	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
67E----------------- Menfro	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
70------------------ Booker	Severe: floods, ponding, percs slowly.	Severe: floods, ponding.	Severe: floods, ponding, too clayey.	Severe: floods, ponding.	Poor: too clayey, hard to pack, ponding.
71------------------ Waldron	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
72------------------ Blake	Severe: wetness.	Severe: floods, wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Fair: wetness.
73------------------ Haynie	Moderate: floods.	Severe: floods.	Moderate: floods.	Moderate: floods.	Good.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
74------------------ Carr	Severe: poor filter.	Severe: seepage, floods.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
75------------------ Hodge	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: too sandy.
76*:					
Haynie-------------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Blake--------------	Severe: wetness, floods.	Severe: floods, wetness, seepage.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Fair: wetness.
77*:					
Hodge--------------	Severe: floods, poor filter.	Severe: seepage, floods.	Severe: floods, seepage, too sandy.	Severe: floods, seepage.	Poor: too sandy.
Blake--------------	Severe: wetness, floods.	Severe: floods, wetness, seepage.	Severe: wetness, seepage, floods.	Severe: wetness, seepage, floods.	Fair: wetness.
79------------------ Dupo	Severe: percs slowly, wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, too clayey.	Severe: wetness, floods.	Poor: wetness.
80------------------ Portage	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
81------------------ Haymond	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
82------------------ Chequest	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness, hard to pack.
83------------------ Lomax	Moderate: floods.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
84------------------ Blase	Severe: percs slowly.	Severe: floods.	Severe: too clayey.	Moderate: floods.	Poor: too clayey, hard to pack.
85------------------ Carlow	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
86------------------ Kampville	Severe: floods, wetness, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness, too clayey.	Severe: floods, wetness.	Poor: too clayey, hard to pack, wetness.
90------------------ Hurst	Severe: wetness, percs slowly.	Severe: floods, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
91*. Pits					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
2D-------------------- Goss	Fair: low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
2F-------------------- Goss	Fair: low strength, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
3--------------------- Twomile	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
4D*:				
Menfro----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
Goss------------------	Fair: low strength, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
6C-------------------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
6D2------------------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
6E-------------------- Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
7B, 7C---------------- Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
7D2------------------- Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
7E2------------------- Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
7F-------------------- Menfro	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
8C-------------------- Winfield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
8D-------------------- Winfield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
8E2------------------- Winfield	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
9E-------------------- Holstein	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
10F*:				
Gasconade-------------	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: thin layer, large stones, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
10F*: Rock outcrop.				
11-------------------- Dockery	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
12-------------------- Kennebec	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
13-------------------- Auxvasse	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
22F*:				
Gatewood-------------	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Gasconade------------	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: thin layer, large stones, area reclaim.
Crider---------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
24D2----------------- Keswick	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
27C------------------ Armster	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
31C------------------ Hatton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
34E------------------ Lindley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
35B------------------ Mexico	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
37------------------- Marion	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
40------------------- Westerville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
41------------------- Freeburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
43------------------- Cedargap	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
44------------------- Sensabaugh	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
48A, 48B, 48C--------- Weller	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
54C*:				
Harvester------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
54C*:				
Urban land.				
54D*:				
Harvester	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Urban land.				
62 Edinburg	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
63B Herrick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
67E Menfro	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, too clayey.
70 Booker	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
71 Waldron	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
72 Blake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
73 Haynie	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
74 Carr	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
75 Hodge	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
76*:				
Haynie	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Blake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
77*:				
Hodge	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Blake	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
79 Dupo	Poor: wetness, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
80 Portage	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
81 Haymond	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
82-------------------- Chequest	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
83-------------------- Lomax	Good-----------------	Probable-------------	Improbable: too sandy.	Fair: small stones, area reclaim.
84-------------------- Blase	Good-----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
85-------------------- Carlow	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
86-------------------- Kampville	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
90-------------------- Hurst	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
91*. Pits				

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
2D, 2F: Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
3: Twomile	Moderate: seepage.	Moderate: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
4D*:						
Menfro	Severe: slope.	Slight	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Goss	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
6C: Crider	Moderate: seepage.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
6D2, 6E: Crider	Moderate: seepage.	Severe: piping.	Deep to water	Slope	Slope	Slope.
7B, 7C: Menfro	Moderate: slope, seepage.	Slight	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
7D2, 7E2, 7F: Menfro	Severe: slope.	Slight	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
8C: Winfield	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Frost action, slope.	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
8D, 8E2: Winfield	Severe: slope.	Moderate: thin layer, wetness.	Frost action, slope.	Wetness, slope, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
9E: Holstein	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
10F*:						
Gasconade	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Droughty, large stones, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
11: Dockery	Moderate: seepage.	Severe: piping, wetness.	Floods, frost action.	Wetness, erodes easily, floods.	Erodes easily, wetness.	Wetness, erodes easily.
12: Kennebec	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Deep to water	Floods	Favorable	Favorable.
13: Auxvasse	Slight	Moderate: wetness.	Percs slowly	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
22F*:						
Gatewood	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
22F*:						
Gasconade	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Droughty, large stones, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Crider	Moderate: seepage.	Severe: piping.	Deep to water	Slope	Slope	Slope.
24D2 Keswick	Severe: slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
27C Armster	Moderate: slope.	Moderate: hard to pack, wetness.	Slope	Wetness, slope, erodes easily.	Erodes easily, wetness.	Erodes easily.
31C Hatton	Moderate: slope.	Moderate: wetness.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Erodes easily, percs slowly.
34E Lindley	Severe: slope.	Slight	Deep to water	Rooting depth, slope.	Slope	Slope, rooting depth.
35B Mexico	Moderate: slope.	Severe: thin layer.	Percs slowly, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
37 Marion	Slight	Moderate: wetness.	Percs slowly	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
40 Westerville	Moderate: seepage.	Severe: wetness.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
41 Freeburg	Slight	Moderate: wetness.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
43 Cedargap	Severe: seepage.	Slight	Deep to water	Floods	Large stones	Favorable.
44 Sensabaugh	Severe: seepage.	Moderate: large stones.	Deep to water	Floods	Large stones	Large stones.
48A Weller	Slight	Moderate: hard to pack, wetness.	Percs slowly, frost action.	Percs slowly, wetness.	Wetness, erodes easily.	Percs slowly, erodes easily.
48B, 48C Weller	Moderate: slope.	Moderate: hard to pack, wetness.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Wetness, erodes easily.	Percs slowly, erodes easily.
54C*:						
Harvester	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
Urban land.						
54D*:						
Harvester	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope	Slope.
Urban land.						
62 Edinburg	Moderate: seepage.	Severe: hard to pack, ponding.	Percs slowly, ponding, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
63B Herrick	Moderate: slope.	Severe: wetness.	Frost action, slope.	Wetness, slope.	Erodes easily, wetness.	Wetness, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
67E: Menfro	Severe: slope.	Slight	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
70: Booker	Slight	Severe: hard to pack, ponding.	Ponding, percs slowly, floods.	Ponding, slow intake, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.
71: Waldron	Slight	Severe: hard to pack.	Percs slowly, frost action.	Wetness, slow intake, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
72: Blake	Severe: seepage.	Severe: piping.	Frost action	Wetness, erodes easily.	Wetness, erodes easily.	Erodes easily.
73: Haynie	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily.	Erodes easily	Erodes easily.
74: Carr	Severe: seepage.	Severe: piping.	Deep to water	Rooting depth.	Soil blowing	Rooting depth.
75: Hodge	Severe: seepage.	Severe: piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
76*:						
Haynie	Moderate: seepage, slope.	Severe: piping.	Deep to water	Erodes easily, floods.	Erodes easily	Erodes easily.
Blake	Severe: seepage.	Severe: piping.	Frost action, floods.	Wetness, erodes easily, floods.	Wetness, erodes easily.	Erodes easily.
77*:						
Hodge	Severe: seepage.	Severe: piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
Blake	Severe: seepage.	Severe: piping.	Frost action, floods.	Wetness, erodes easily, floods.	Wetness, erodes easily.	Erodes easily.
79: Dupo	Slight	Severe: wetness.	Percs slowly, floods, frost action.	Wetness, percs slowly, erodes easily.	Wetness, percs slowly.	Wetness, erodes easily, percs slowly.
80: Portage	Slight	Severe: hard to pack, wetness.	Percs slowly, floods.	Wetness, droughty, slow intake.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, droughty.
81: Haymond	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, floods.	Erodes easily	Erodes easily.
82: Chequest	Slight	Severe: wetness.	Floods, frost action.	Floods, wetness.	Wetness, erodes easily.	Wetness, erodes easily.
83: Lomax	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
84: Blase	Moderate: seepage.	Severe: thin layer.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
85: Carlow	Slight	Severe: hard to pack, wetness.	Percs slowly, floods.	Wetness	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
86: Kampville	Slight	Severe: wetness.	Floods, frost action.	Wetness, erodes easily, floods.	Erodes easily, wetness.	Wetness, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
90----------------- Hurst	Slight---------	Severe: wetness.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
91*. Pits						

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
2D----------------- Goss	0-4	Silt loam--------	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	4-16	Cherty silt loam, cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	16-60	Cherty silty clay loam, cherty silty clay, very cherty silty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
2F----------------- Goss	0-3	Cherty silt loam	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	3-16	Cherty silt loam, cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	16-60	Cherty silty clay loam, cherty silty clay, very cherty silty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
3----------------- Twomile	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	6-28	Silt loam--------	CL-ML, CL	A-4	0	100	100	95-100	90-100	25-30	5-10
	28-60	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	85-95	30-45	15-25
4D*:											
Menfro-----------	0-14	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	14-43	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	43-67	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
Goss-------------	0-4	Silt loam--------	ML, CL, CL-ML	A-4	0-10	65-90	65-90	65-90	65-85	20-30	2-8
	4-16	Cherty silt loam, cherty silty clay loam.	GM, GC, GM-GC	A-2	10-40	40-60	35-55	30-50	25-35	20-30	2-8
	16-60	Cherty silty clay loam, cherty silty clay, cherty clay.	GC	A-7	10-45	45-70	40-65	40-50	35-45	50-70	30-40
6C, 6D2, 6E------ Crider	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	8-23	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	23-60	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
7B, 7C----------- Menfro	0-14	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	14-43	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	43-67	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
7D2, 7E2--------- Menfro	0-5	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	5-33	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	33-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
7F----------------- Menfro	0-14	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	14-43	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	43-67	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
8C, 8D----------- Winfield	0-7	Silt loam--------	CL	A-6	0	100	100	95-100	90-100	25-40	10-20
	7-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
8E2-------------- Winfield	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	35-45	20-25
	7-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
9E--------------- Holstein	0-6	Loam-------------	CL-ML, CL	A-4, A-6	0-10	90-100	85-100	70-90	55-75	20-30	5-15
	6-14	Clay loam, loam	CL	A-4, A-6	0-5	95-100	90-100	80-95	60-80	25-35	8-15
	14-42	Clay loam--------	CL	A-6	0-5	95-100	90-100	80-95	60-80	30-40	11-20
	42-60	Sandy clay loam, clay loam.	SC, CL	A-4, A-6	0-5	95-100	85-100	75-90	36-55	25-35	8-15
10F*:											
Gasconade-------	0-4	Silty clay loam	CL	A-7	0-5	90-95	85-90	80-85	75-80	40-50	15-25
	4-15	Flaggy silty clay, flaggy clay, cherty silty clay loam.	GC	A-2-7	20-70	45-55	40-50	30-40	20-35	55-65	35-45
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
11--------------- Dockery	0-60	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-40	5-18
12--------------- Kennebec	0-37	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	37-60	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-15
13--------------- Auxvasse	0-13	Silt loam, silty clay.	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-100	25-35	5-15
	13-29	Silty clay, clay	CH	A-7	0	100	100	95-100	90-100	50-65	30-40
	29-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	90-96	35-45	20-25
22F*:											
Gatewood--------	0-7	Silt loam, silty clay.	CL	A-4, A-6	0-10	85-100	80-100	70-100	65-100	25-35	7-15
	7-24	Cherty silty clay, cherty clay, clay.	CH	A-7	5-15	80-95	70-90	60-85	60-85	55-75	30-45
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gasconade-------	0-4	Silty clay loam	CL	A-7	0-5	90-95	85-90	80-85	75-80	40-50	15-25
	4-15	Flaggy silty clay, flaggy clay.	GC	A-2-7	20-70	45-55	40-50	30-40	20-35	55-65	35-45
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Crider----------	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	8-23	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	23-60	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
24D2------------- Keswick	0-8	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	8-60	Clay loam, clay	CH, MH	A-7	0-5	90-100	80-100	70-90	55-80	50-60	20-30

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
27C--------------- Armster	0-20	Silt loam--------	CL	A-6, A-4	0	95-100	95-100	95-100	90-100	25-40	11-20
	20-63	Clay loam, clay	CL, CH	A-7	0	95-100	80-95	70-90	55-80	45-60	25-35
31C--------------- Hatton	0-15	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	80-100	25-40	5-15
	15-29	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	25-35
	29-38	Silty clay loam	CL	A-6, A-7	0	100	85-95	80-90	75-85	30-45	15-25
	38-67	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7	0	95-100	80-95	70-90	60-85	30-45	15-25
34E--------------- Lindley	0-5	Loam-------------	CL-ML, CL	A-4, A-6	0	95-100	90-100	85-95	50-65	15-30	5-15
	5-60	Clay loam, loam, clay.	CL, CH	A-6, A-7	0	95-100	90-100	85-95	55-75	30-55	15-25
35B--------------- Mexico	0-13	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	13-22	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	45-60	30-40
	22-31	Silty clay, clay	CH	A-7	0	100	100	95-100	95-100	60-75	40-50
	31-70	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-60	25-35
37---------------- Marion	0-13	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	90-100	30-40	5-15
	13-32	Silty clay-------	CH	A-7	0	100	100	95-100	90-100	50-65	30-40
	32-60	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	35-45	20-25
40---------------- Westerville	0-23	Silt loam--------	ML, CL	A-6	0	100	100	95-100	85-100	30-40	12-20
	23-52	Silt loam--------	CL	A-6	0	100	100	85-100	75-90	30-40	25-32
	52-60	Silty clay loam, loam.	CL	A-6, A-7	0	100	100	85-100	80-100	35-45	25-35
41---------------- Freeburg	0-19	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	90-100	15-35	5-15
	19-60	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	100	85-100	85-100	30-45	15-25
43---------------- Cedargap	0-5	Silt loam--------	ML	A-4	0-5	90-100	85-95	75-95	70-95	25-35	3-9
	5-60	Cherty silt loam, cherty silty clay loam, very cherty loam.	GC	A-2-6, A-6, A-1	5-20	25-50	20-50	15-45	15-40	30-40	15-25
44---------------- Sensabaugh	0-16	Silt loam--------	CL-ML, CL, ML	A-4	0-5	90-100	75-95	65-85	55-75	16-29	3-9
	16-30	Gravelly loam, gravelly clay loam, silt loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	2-18	70-95	55-90	45-75	35-65	20-35	5-14
	30-60	Very cherty loam, gravelly clay loam, very cherty sandy clay loam.	SM-SC, SC, GM-GC, GC	A-4, A-6, A-2	5-30	55-90	25-75	25-65	20-55	20-36	6-15
48A, 48B, 48C---- Weller	0-10	Silt loam--------	ML, CL	A-6, A-4	0	100	100	100	95-100	30-40	5-15
	10-41	Silty clay loam, silty clay.	CH	A-7	0	100	100	100	95-100	50-65	30-40
	41-63	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	20-30
54C*, 54D*: Harvester-------	0-7	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	25-35	9-19
	7-31	Silty clay loam, silt loam.	CL	A-6, A-7-6	0	100	100	95-100	90-100	35-45	20-25
	31-67	Silty clay loam, silt loam.	CL	A-6, A-7-6	0	100	98-100	92-98	90-95	35-45	20-25
Urban land.											

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
62--------------- Edinburg	0-20	Silty clay loam, silty clay.	CL	A-7, A-6	0	100	100	98-100	90-100	35-50	16-25
	20-60	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	98-100	90-100	45-70	28-45
63B-------------- Herrick	0-22	Silt loam--------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
	22-60	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	95-100	90-100	45-60	25-40
67E-------------- Menfro	0-14	Silt loam--------	CL	A-6	0	100	100	95-100	92-100	25-35	11-20
	14-43	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-45	20-25
	43-67	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	95-100	92-100	25-35	5-15
70--------------- Booker	0-12	Clay-------------	CL, CH	A-7	0	100	100	95-100	95-100	45-70	30-45
	12-60	Clay-------------	CH	A-7	0	100	100	100	95-100	65-85	40-55
71--------------- Waldron	0-6	Silty clay-------	CL, CH	A-7	0	100	100	95-100	95-100	45-65	30-45
	6-60	Stratified silty clay loam to clay.	CL, CH	A-7	0	100	100	95-100	90-100	40-65	20-45
72--------------- Blake	0-25	Silty clay loam	CL	A-7, A-6	0	100	100	90-100	85-95	35-50	15-30
	25-60	Silt loam, loam, very fine sandy loam.	ML, CL	A-4, A-6	0	100	100	80-90	75-90	30-40	5-15
73--------------- Haynie	0-60	Silt loam, very fine sandy loam, loamy very fine sand.	CL-ML, CL	A-4, A-6	0	100	100	85-100	85-100	25-35	5-15
74--------------- Carr	0-15	Fine sandy loam	SM, SC, ML, CL	A-4	0	100	95-100	70-100	35-75	10-25	2-10
	15-34	Stratified fine sandy loam to loam.	SM, SC, ML, CL	A-4	0	100	95-100	70-100	35-65	10-25	2-10
	34-60	Loamy sand, loamy fine sand, fine sand.	SM	A-2-4	0	98-100	85-100	65-95	20-30	---	NP
75--------------- Hodge	0-7	Loamy fine sand	SM	A-2, A-4	0	100	100	60-85	25-45	---	NP
	7-60	Loamy fine sand, fine sand.	SM	A-2, A-4	0	100	100	60-85	25-45	---	NP
76*:											
Haynie-----------	0-60	Silt loam, very fine sandy loam.	CL-ML, CL	A-4, A-6	0	100	100	85-100	85-100	25-35	5-15
Blake------------	0-25	Silty clay loam	CL	A-7, A-6	0	100	100	90-100	85-95	35-50	15-30
	25-60	Silt loam, loam, very fine sandy loam.	ML, CL	A-4, A-6	0	100	100	80-90	75-90	30-40	5-15
77*:											
Hodge------------	0-7	Loamy fine sand	SM	A-2, A-4	0	100	100	60-85	25-45	---	NP
	7-60	Loamy fine sand, fine sand.	SM	A-2, A-4	0	100	100	60-85	25-45	---	NP
Blake------------	0-25	Silty clay loam	CL	A-7, A-6	0	100	100	90-100	85-95	35-50	15-30
	25-60	Silt loam, loam, very fine sandy loam.	ML, CL	A-4, A-6	0	100	100	80-90	75-90	30-40	5-15
79--------------- Dupo	0-10	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-35	1-15
	10-20	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	20-35	5-15
	20-60	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0	100	100	100	98-100	35-55	15-30

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
80--------------- Portage	0-9	Clay-------------	CL, CH	A-7	0	100	100	95-100	90-100	45-70	30-45
	9-75	Clay-------------	CH	A-7	0	100	100	100	95-100	50-75	35-55
81--------------- Haymond	0-10	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	10-60	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
82--------------- Chequest	0-20	Silt loam, silty clay loam.	CL	A-7	0	100	100	98-100	95-100	40-50	15-25
	20-60	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	98-100	90-100	45-60	20-30
83--------------- Lomax	0-24	Loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	80-95	80-95	60-75	25-35	5-15
	24-40	Sandy loam, loam, very fine sandy loam.	SM, SC, CL, ML	A-4, A-6, A-2	0	100	80-95	80-95	30-60	20-30	3-13
	40-60	Stratified sandy loam to sand.	SP-SM, SP, SM	A-3, A-2	0-5	100	70-90	70-90	3-20	<20	NP
84--------------- Blase	0-10	Silty clay loam	CL	A-7, A-6	0	100	100	95-100	85-95	35-45	20-30
	10-32	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-65	25-40
	32-48	Loam, silt loam	CL, ML	A-4	0	100	100	85-95	60-80	30-40	8-20
	48-60	Very fine sandy loam.	ML, CL-ML	A-6, A-4	0	100	100	85-95	50-65	15-30	NP-7
85--------------- Carlow	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-100	30-45	15-25
	8-60	Silty clay, clay	CL, CH	A-7	0	100	100	95-100	95-100	45-75	30-50
86--------------- Kampville	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	27-35	10-15
	13-60	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-95	45-60	30-40
90--------------- Hurst	0-16	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	24-35	6-14
	16-60	Silty clay, clay, silty clay loam.	CH, CL	A-7, A-6	0	100	100	95-100	90-100	35-65	25-40
91*. Pits											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
2D--------------- Goss	0-4	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-6.0	Low-----------	0.24	2	6	1-2
	4-16	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.0	Low-----------	0.24			
	16-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate-----	0.24			
2F--------------- Goss	0-3	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-6.0	Low-----------	0.24	2	6	1-2
	3-16	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.0	Low-----------	0.24			
	16-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate-----	0.24			
3---------------- Twomile	0-6	12-27	1.35-1.45	0.6-2.0	0.22-0.24	6.1-6.0	Low-----------	0.43	5	6	1-2
	6-28	12-27	1.40-1.50	0.2-0.6	0.10-0.13	3.6-6.0	Low-----------	0.43			
	28-60	27-35	1.30-1.40	0.06-0.2	0.08-0.10	3.6-6.5	Moderate-----	0.43			
4D*:											
Menfro-----------	0-14	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	6	.5-2
	14-43	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	43-67	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.37			
Goss-------------	0-4	7-27	1.10-1.30	2.0-6.0	0.06-0.17	4.5-6.0	Low-----------	0.24	2	6	1-2
	4-16	20-30	1.10-1.30	2.0-6.0	0.06-0.10	4.5-6.0	Low-----------	0.24			
	16-60	35-60	1.30-1.50	0.6-2.0	0.04-0.09	4.5-6.0	Moderate-----	0.24			
6C, 6D2, 6E------ Crider	0-8	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low-----------	0.32	4	---	2-4
	8-23	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low-----------	0.28			
	23-60	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.0	Moderate-----	0.28			
7B, 7C----------- Menfro	0-14	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	6	.5-2
	14-43	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	43-67	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.37			
7D2, 7E2--------- Menfro	0-5	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	6	.5-1
	5-33	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	33-60	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.37			
7F--------------- Menfro	0-14	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	6	.5-2
	14-43	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.37			
	43-67	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.37			
8C, 8D----------- Winfield	0-7	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	6	.5-2
	7-60	27-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
8E2-------------- Winfield	0-7	27-30	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37	4	7	.5-2
	7-60	27-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
9E--------------- Holstein	0-6	12-27	1.20-1.45	0.6-2.0	0.20-0.22	5.6-6.5	Low-----------	0.32	5	6	.5-2
	6-14	18-27	1.35-1.50	0.6-2.0	0.17-0.19	5.1-6.0	Low-----------	0.32			
	14-42	27-35	1.40-1.55	0.6-2.0	0.15-0.17	4.5-6.0	Moderate-----	0.32			
	42-60	20-35	1.45-1.65	0.6-2.0	0.15-0.17	4.5-6.0	Low-----------	0.32			
10F*:											
Gasconade--------	0-4	35-50	1.30-1.45	0.6-2.0	0.12-0.15	6.1-7.8	Moderate-----	0.32	2	7	2-4
	4-15	40-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate-----	0.20			
	15	---	---	---	---	---	-------------	----			
Rock outcrop.											

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm^3	In/hr	In/in	pH					Pct
11---------------- Dockery	0-60	15-27	1.35-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	6	2-4
12---------------- Kennebec	0-37	22-30	1.25-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Moderate------	0.32	5	6	5-6
	37-60	24-28	1.35-1.40	0.6-2.0	0.20-0.22	6.1-7.3	Moderate------	0.43			
13---------------- Auxvasse	0-13	8-16	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.43	3	6	.5-1
	13-29	35-50	1.35-1.50	<0.06	0.09-0.11	4.5-5.5	High----------	0.43			
	29-60	25-40	1.35-1.50	0.2-0.6	0.18-0.20	4.5-5.5	Moderate------	0.43			
22F*:											
Gatewood---------	0-7	15-25	1.10-1.40	0.6-2.0	0.20-0.22	6.6-7.8	Low-----------	0.43	3	6	.5-2
	7-24	60-85	1.10-1.30	0.06-0.2	0.09-0.12	6.6-7.8	High----------	0.32			
	24	---	---	---	---	---	--------------	----			
Gasconade--------	0-4	35-50	1.30-1.45	0.6-2.0	0.12-0.15	6.1-7.8	Moderate------	0.32	2	7	2-4
	4-15	40-60	1.45-1.70	0.2-0.6	0.05-0.07	6.1-7.8	Moderate------	0.20			
	15	---	---	---	---	---	--------------	----			
Crider-----------	0-8	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low-----------	0.32	4	6	2-4
	8-23	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low-----------	0.28			
	23-60	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.0	Moderate------	0.28			
24D2-------------- Keswick	0-8	22-27	1.45-1.50	0.6-2.0	0.17-0.22	4.5-7.3	Moderate------	0.37	3	6	1-2
	8-60	35-48	1.45-1.60	0.06-0.2	0.11-0.15	4.5-6.0	High----------	0.37			
27C--------------- Armster	0-20	15-27	1.35-1.50	0.6-2.0	0.17-0.20	4.5-7.3	Moderate------	0.37	5	6	1-2
	20-63	35-48	1.35-1.45	0.2-0.6	0.10-0.18	4.5-7.3	High----------	0.37			
31C--------------- Hatton	0-15	12-27	1.35-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.43	4	6	1-2
	15-29	35-48	1.30-1.40	0.06-0.2	0.11-0.18	4.5-5.5	Moderate------	0.32			
	29-38	27-35	1.45-1.65	<0.06	0.10-0.15	4.5-5.5	Low-----------	0.43			
	38-67	25-35	1.35-1.50	0.06-0.2	0.11-0.18	5.1-6.0	Moderate------	0.43			
34E--------------- Lindley	0-5	18-27	1.20-1.40	0.6-2.0	0.16-0.18	4.5-7.3	Low-----------	0.32	5	6	1-2
	5-60	25-35	1.50-1.75	0.2-0.6	0.14-0.18	3.6-6.5	Moderate------	0.32			
35B--------------- Mexico	0-13	15-25	1.10-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.43	3	6	2-4
	13-22	25-35	1.20-1.40	0.2-0.6	0.16-0.20	4.5-6.0	High----------	0.32			
	22-31	40-55	1.20-1.40	<0.06	0.15-0.20	4.5-6.0	High----------	0.32			
	31-70	35-45	1.20-1.40	0.2-0.6	0.15-0.20	5.1-7.3	High----------	0.32			
37---------------- Marion	0-13	12-27	1.30-1.45	0.6-2.0	0.22-0.24	4.5-6.5	Low-----------	0.43	3	6	1-2
	13-32	48-60	1.30-1.65	<0.06	0.11-0.13	4.5-5.5	High----------	0.32			
	32-60	30-40	1.35-1.45	<0.06	0.15-0.17	4.5-6.0	Moderate------	0.43			
40---------------- Westerville	0-23	12-17	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	5	6	1-2
	23-52	18-27	1.35-1.45	0.6-2.0	0.20-0.22	4.5-5.5	Low-----------	0.37			
	52-60	27-38	1.30-1.40	0.6-2.0	0.18-0.20	5.1-6.0	Low-----------	0.37			
41---------------- Freeburg	0-19	12-25	1.20-1.45	0.6-2.0	0.22-0.24	6.1-7.3	Low-----------	0.37	5	6	.5-2
	19-60	27-35	1.40-1.50	0.2-0.6	0.18-0.20	4.5-6.0	Moderate------	0.37			
43---------------- Cedargap	0-5	15-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.32	5	6	1-4
	5-60	25-35	1.40-1.55	2.0-6.0	0.04-0.10	5.6-7.3	Low-----------	0.24			
44---------------- Sensabaugh	0-16	8-25	1.25-1.40	2.0-6.0	0.12-0.18	5.6-7.8	Low-----------	0.20	5	5	1-3
	16-30	18-35	1.30-1.50	2.0-6.0	0.10-0.16	5.6-7.8	Low-----------	0.20			
	30-60	12-38	1.25-1.50	2.0-6.0	0.08-0.14	5.6-7.8	Low-----------	0.20			
48A, 48B, 48C---- Weller	0-10	16-27	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	6	1-2
	10-41	28-48	1.35-1.50	0.06-0.2	0.12-0.18	4.5-6.0	High----------	0.43			
	41-63	28-40	1.40-1.55	0.2-0.6	0.18-0.20	5.1-6.0	High----------	0.43			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
54C*, 54D*:											
Harvester	0-7	18-25	1.40-1.60	0.2-0.6	0.10-0.20	5.6-7.3	Low	0.32	5	6	.5-2
	7-31	18-35	1.35-1.60	0.2-0.6	0.10-0.20	5.6-7.3	Moderate	0.32			
	31-67	18-35	1.35-1.50	0.6-2.0	0.18-0.24	5.6-7.3	Moderate	0.32			
Urban land.											
62 Edinburg	0-20	25-35	1.10-1.30	0.6-2.0	0.21-0.24	5.6-7.3	High	0.37	4	6	3-4
	20-60	35-46	1.20-1.40	0.06-0.6	0.13-0.20	5.6-7.3	High	0.37			
63B Herrick	0-22	20-27	1.15-1.30	0.6-2.0	0.22-0.24	5.1-6.5	Moderate	0.32	4	6	3-4
	22-60	35-42	1.20-1.40	0.2-0.6	0.12-0.17	4.5-6.0	High	0.43			
67E Menfro	0-14	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	6	.5-2
	14-43	27-35	1.35-1.50	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37			
	43-67	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37			
70 Booker	0-12	46-55	1.30-1.50	<0.06	0.12-0.14	5.6-7.3	Very high	0.28	5	4	1-3
	12-60	60-75	1.30-1.50	<0.06	0.09-0.11	5.6-7.3	Very high	0.28			
71 Waldron	0-6	40-50	1.35-1.45	0.06-0.2	0.12-0.14	6.6-7.8	High	0.32	5	4	2-4
	6-60	35-50	1.45-1.60	0.06-0.2	0.10-0.18	7.4-8.4	High	0.32			
72 Blake	0-25	27-35	1.25-1.30	0.6-2.0	0.20-0.22	6.6-8.4	Moderate	0.37	5	4L	1-3
	25-60	10-20	1.30-1.35	0.6-6.0	0.20-0.22	7.4-8.4	Low	0.37			
73 Haynie	0-60	15-25	1.20-1.35	0.6-2.0	0.18-0.23	6.6-8.4	Low	0.37	5	4L	1-3
74 Carr	0-15	5-15	1.50-1.75	2.0-6.0	0.14-0.20	7.4-8.4	Low	0.24	5	3	<1
	15-34	5-15	1.50-1.75	2.0-6.0	0.13-0.18	7.4-8.4	Low	0.24			
	34-60	2-8	1.20-1.60	6.0-20	0.06-0.09	7.4-8.4	Low	0.15			
75 Hodge	0-7	10-15	1.40-1.50	>6.0	0.07-0.12	6.6-7.8	Low	0.17	5	2	.5-1
	7-60	8-12	1.40-1.55	>6.0	0.06-0.10	6.6-7.8	Low	0.17			
76*:											
Haynie	0-60	15-25	1.20-1.35	0.6-2.0	0.18-0.23	6.6-8.4	Low	0.37	5	4L	1-3
Blake	0-25	27-35	1.25-1.30	0.6-2.0	0.20-0.22	6.6-8.4	Moderate	0.37	5	4L	1-3
	25-60	10-20	1.30-1.35	0.6-6.0	0.20-0.22	7.4-8.4	Low	0.37			
77*:											
Hodge	0-7	10-15	1.40-1.50	>6.0	0.07-0.12	6.6-7.8	Low	0.17	5	2	.5-1
	7-60	8-12	1.40-1.55	>6.0	0.06-0.10	6.6-7.8	Low	0.17			
Blake	0-25	27-35	1.25-1.30	0.6-2.0	0.20-0.22	6.6-8.4	Moderate	0.37	5	4L	1-3
	25-60	10-20	1.30-1.35	0.6-6.0	0.20-0.22	7.4-8.4	Low	0.37			
79 Dupo	0-10	---	---	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	5	1-2
	10-20	---	---	0.2-0.6	0.20-0.22	5.6-8.4	Low	0.37			
	20-60	---	---	0.06-0.2	0.08-0.19	6.1-7.8	High	0.37			
80 Portage	0-9	45-75	1.25-1.45	<0.06	0.12-0.14	5.1-6.0	Very high	0.37	5	4	2-4
	9-75	60-80	1.30-1.45	<0.06	0.09-0.11	4.5-5.5	Very high	0.37			
81 Haymond	0-10	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	5	5	1-3
	10-60	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.37			
82 Chequest	0-20	30-35	1.30-1.35	0.2-0.6	0.18-0.20	5.6-7.3	High	0.28	5	7	3-4
	20-60	35-42	1.35-1.45	0.2-0.6	0.14-0.18	5.1-6.0	High	0.43			
83 Lomax	0-24	12-18	1.35-1.55	2.0-6.0	0.18-0.22	5.1-6.5	Low	0.28	5	5	2-4
	24-40	8-18	1.50-1.70	2.0-6.0	0.12-0.19	5.1-6.5	Low	0.28			
	40-60	3-12	1.70-2.00	2.0-6.0	0.05-0.11	5.1-7.3	Low	0.15			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
84---------------- Blase	0-10	32-40	1.30-1.45	0.2-0.6	0.19-0.21	5.6-6.5	Moderate-----	0.28	5	7	2-4
	10-32	35-60	1.30-1.45	0.06-0..2	0.12-0.21	5.6-6.0	High---------	0.28			
	32-48	7-20	1.30-1.45	0.6-2.0	0.18-0.20	6.6-7.8	Low----------	0.28			
	48-60	0-20	1.30-1.45	0.6-2.0	0.17-0.19	6.6-7.8	Low----------	0.28			
85---------------- Carlow	0-8	18-35	1.35-1.50	0.2-0.6	0.21-0.23	5.1-6.0	Moderate-----	0.37	5	7	2-4
	8-60	45-60	1.25-1.35	<0.06	0.09-0.12	4.5-6.0	High---------	0.37			
86---------------- Kampville	0-13	20-27	1.35-1.50	0.6-2.0	0.22-0.24	5.1-6.0	Low----------	0.43	5	6	1-2
	13-60	35-48	1.30-1.45	0.2-0.6	0.18-0.20	4.5-6.0	High---------	0.43			
90---------------- Hurst	0-16	20-27	1.25-1.45	0.2-0.6	0.22-0.24	4.5-6.5	Moderate-----	0.43	3	6	1-2
	16-60	35-48	1.45-1.70	<0.06	0.10-0.20	4.5-7.3	High---------	0.32			
91*. Pits											

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained i
The symbol > means more than. Absence of an entry indicates that the feature is not a concern or tha
not estimated]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Poten fro acti
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
2D, 2F----------- Goss	B	None--------	---	---	>6.0	---	---	>60	---	Moder
3---------------- Twomile	C/D	Rare--------	---	---	1.0-2.0	Perched	Nov-May	>60	---	High-
4D*:										
Menfro-----------	B	None--------	---	---	>6.0	---	---	>60	---	High-
Goss-------------	B	None--------	---	---	>6.0	---	---	>60	---	Moder
6C, 6D2, 6E------- Crider	B	None--------	---	---	>6.0	---	---	>60	---	--
7B, 7C, 7D2, 7E2, 7F--------------- Menfro	B	None--------	---	---	>6.0	---	---	>60	---	High-
8C, 8D, 8E2------- Winfield	B	None--------	---	---	2.5-4.0	Perched	Nov-Apr	>60	---	High-
9E--------------- Holstein	B	None--------	---	---	>6.0	---	---	>60	---	Moder
10F*:										
Gasconade--------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moder
Rock outcrop.										
11--------------- Dockery	C	Occasional	Brief-----	Nov-Jun	1.0-3.0	Apparent	Nov-Apr	>60	---	High-
12--------------- Kennebec	B	Occasional	Brief-----	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	>60	---	High-
13--------------- Auxvasse	D	Rare--------	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moder
22F*:										
Gatewood---------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moder
Gasconade--------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moder
Crider-----------	B	None--------	---	---	>6.0	---	---	>60	---	--
24D2------------- Keswick	D	None--------	---	---	1.0-3.0	Perched	Nov-Jul	>60	---	High-
27C-------------- Armster	C	None--------	---	---	2.5-4.0	Perched	Nov-Mar	>60	---	Moder

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Poten fro acti
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
31C----------------- Hatton	C	None---------	---	---	1.5-3.0	Perched	Oct-Apr	>60	---	High-
34E----------------- Lindley	C	None---------	---	---	>6.0	---	---	>60	---	Moder
35B----------------- Mexico	D	None---------	---	---	1.0-2.0	Perched	Nov-Apr	>60	---	Moder
37------------------ Marion	D	None---------	---	---	1.0-2.0	Perched	Nov-May	>60	---	Moder
40------------------ Westerville	C	Rare---------	---	---	1.0-3.0	Apparent	Nov-Apr	>60	---	High-
41------------------ Freeburg	C	Rare---------	---	---	1.5-3.0	Perched	Nov-May	>60	---	High-
43------------------ Cedargap	B	Occasional	Very brief	Nov-Mar	>6.0	---	---	>60	---	Moder
44------------------ Sensabaugh	B	Occasional	Very brief	Jan-Apr	4.0-6.0	Apparent	Jan-Apr	>60	---	--
48A, 48B, 48C------ Weller	C	None---------	---	---	2.0-4.0	Apparent	Nov-Jul	>60	---	High-
54C*, 54D*: Harvester---------	B	None---------	---	---	>6.0	---	---	>60	---	High-
Urban land.										
62------------------ Edinburg	C	None---------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-
63B----------------- Herrick	B	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-
67E----------------- Menfro	B	None---------	---	---	>6.0	---	---	>60	---	High-
70------------------ Booker	D	Frequent----	Brief to long.	Apr-Jul	+.5-1.0	Perched	Nov-May	>60	---	Moder
71------------------ Waldron	D	Rare---------	Brief-----	Mar-Jun	1.0-3.0	Perched	Nov-May	>60	---	High-
72------------------ Blake	B	Rare---------	Very brief	Feb-Nov	2.0-4.0	Apparent	Nov-Jul	>60	---	High-
73------------------ Haynie	B	Rare---------	Very brief	Feb-Nov	>6.0	---	---	>60	---	High-

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Poten fr act
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	
					Ft			In		
74----------------- Carr	B	Rare---------	Very brief	Mar-Sep	>6.0	---	---	>60	---	Low-
75----------------- Hodge	A	Frequent----	Brief to long.	Apr-Jul	>6.0	---	---	>60	---	Low-
76*:										
Haynie-----------	B	Occasional	Very brief	Feb-Nov	>6.0	---	---	>60	---	High-
Blake------------	B	Occasional	Very brief	Feb-Nov	2.0-4.0	Apparent	Nov-Jul	>60	---	High-
77*:										
Hodge------------	A	Frequent----	Brief to long.	Apr-Jul	>6.0	---	---	>60	---	Low-
Blake------------	B	Frequent----	Very brief	Feb-Nov	2.0-4.0	Apparent	Nov-Jul	>60	---	High-
79----------------- Dupo	C	Frequent----	Long------	Jan-Jun	1.0-3.0	Apparent	Jan-Jun	>60	---	High-
80----------------- Portage	D	Occasional	Brief to long.	Mar-Jul	+.5-1.0	Perched	Nov-May	>60	---	Moder
81----------------- Haymond	B	Occasional	Brief-----	Jan-May	>6.0	---	---	>60	---	High-
82----------------- Chequest	C	Occasional	Long------	Feb-Nov	1.0-3.0	Apparent	Nov-Jul	>60	---	High-
83----------------- Lomax	B	Rare---------	---	---	>6.0	---	---	>60	---	Moder
84----------------- Blase	C	Rare---------	---	---	>6.0	---	---	>60	---	High-
85----------------- Carlow	D	Occasional	Brief to long.	Apr-Jun	0-1.0	Perched	Nov-Mar	>60	---	Moder
86----------------- Kampville	C	Occasional	Brief to long.	Mar-Jun	1.0-3.0	Apparent	Nov-May	>60	---	High-
90----------------- Hurst	D	Rare---------	---	---	1.0-3.0	Apparent	Feb-Apr	>60	---	Moder
91*. Pits										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Armster	Fine, montmorillonitic, mesic Mollic Hapludalfs
Auxvasse	Fine, montmorillonitic, mesic Aeric Albaqualfs
Blake	Fine-silty, mixed (calcareous), mesic Aquic Udifluvents
Blase	Clayey over loamy, montmorillonitic, mesic Aquic Hapludolls
Booker	Very-fine, montmorillonitic, mesic Vertic Haplaquolls
Carlow	Fine, montmorillonitic, mesic Vertic Haplaquolls
Carr	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Cedargap	Loamy-skeletal, mixed, mesic Cumulic Hapludolls
*Chequest	Fine, montmorillonitic, mesic Typic Haplaquolls
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
Dockery	Fine-silty, mixed, nonacid, mesic Aquic Udifluvents
Dupo	Coarse-silty over clayey, mixed, nonacid, mesic Aquic Udifluvents
Edinburg	Fine, montmorillonitic, mesic Typic Argiaquolls
Freeburg	Fine-silty, mixed, mesic Aquic Hapludalfs
Gasconade	Clayey-skeletal, mixed, mesic Lithic Hapludolls
*Gatewood	Very-fine, mixed, mesic Typic Hapludalfs
Goss	Clayey-skeletal, mixed, mesic Typic Paleudalfs
Harvester	Fine-silty, mixed, nonacid, mesic Typic Udorthents
Hatton	Fine, montmorillonitic, mesic Typic Hapludalfs
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Haynie	Coarse-silty, mixed (calcareous), mesic Mollic Udifluvents
Herrick	Fine, montmorillonitic, mesic Aquic Argiudolls
Hodge	Mixed, mesic Typic Udipsamments
Holstein	Fine-loamy, mixed, mesic Typic Paleudalfs
Hurst	Fine, montmorillonitic, mesic Aeric Ochraqualfs
Kampville	Fine, montmorillonitic, mesic Typic Ochraqualfs
Kennebec	Fine-silty, mixed, mesic Cumulic Hapludolls
Keswick	Fine, montmorillonitic, mesic Aquic Hapludalfs
*Lindley	Fine-loamy, mixed, mesic Typic Hapludalfs
Lomax	Coarse-loamy, mixed, mesic Cumulic Hapludolls
Marion	Fine, montmorillonitic, mesic Albaquic Hapludalfs
Menfro	Fine-silty, mixed, mesic Typic Hapludalfs
Mexico	Fine, montmorillonitic, mesic Udollic Ochraqualfs
Portage	Very-fine, montmorillonitic, mesic Vertic Haplaquolls
Sensabaugh	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Twomile	Fine-silty, mixed, mesic Typic Albaqualfs
*Waldron	Fine, montmorillonitic (calcareous), mesic Aeric Fluvaquents
Weller	Fine, montmorillonitic, mesic Aquic Hapludalfs
*Westerville	Fine-silty, mixed, acid, mesic Aeric Fluvaquents
Winfield	Fine-silty, mixed, mesic Typic Hapludalfs

* The soil is a taxadjunct to the series. See text for description of those characteristics of the soil that are outside the range of the series.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1982-355-215/1106

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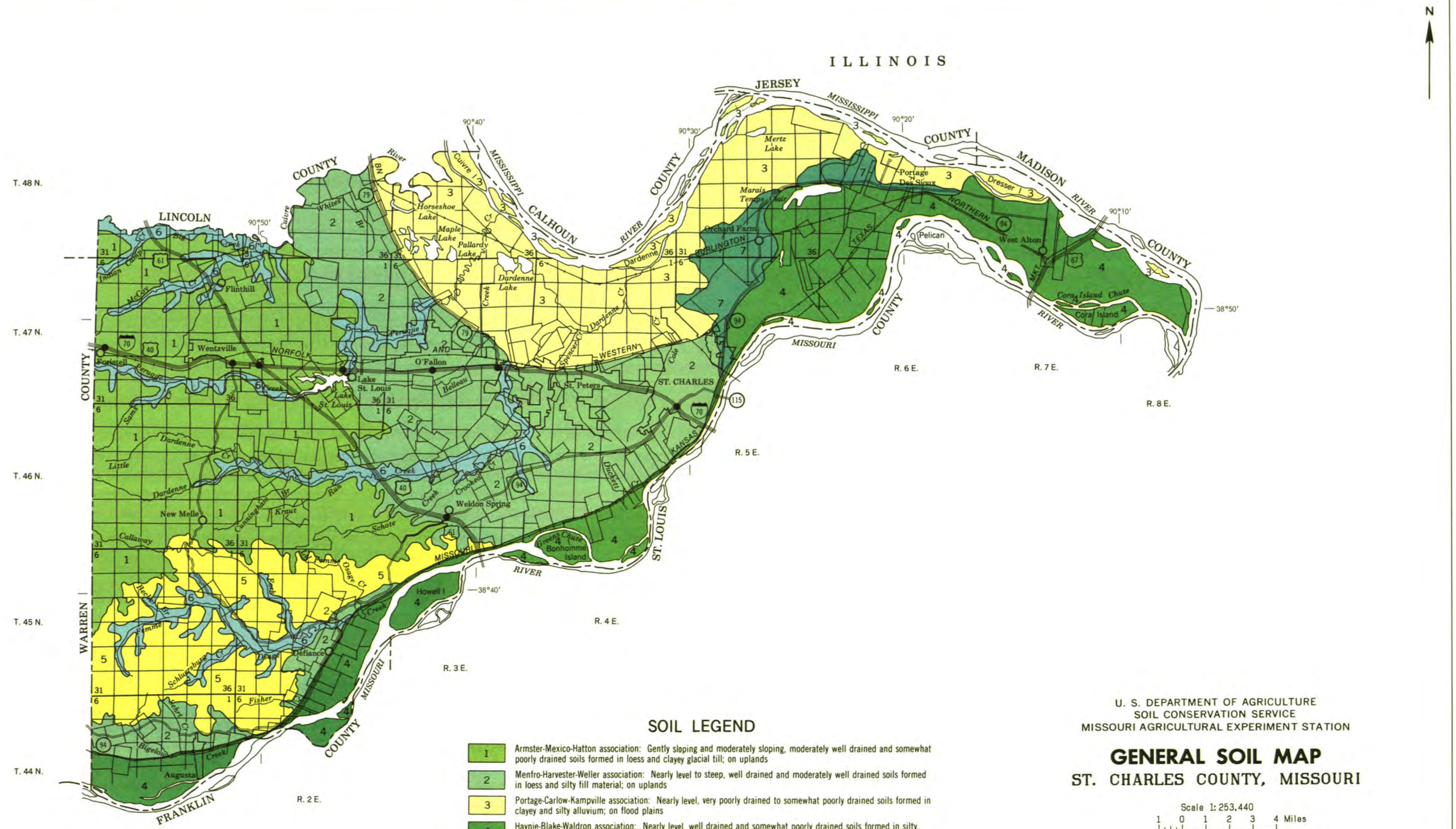


SOIL LEGEND

1	Armster-Mexico-Hatton association: Gently sloping and moderately sloping, moderately well drained and somewhat poorly drained soils formed in loess and clayey glacial till; on uplands
2	Menfro-Harvester-Weller association: Nearly level to steep, well drained and moderately well drained soils formed in loess and silty fill material; on uplands
3	Portage-Carlow-Kampville association: Nearly level, very poorly drained to somewhat poorly drained soils formed in clayey and silty alluvium; on flood plains
4	Haynie-Blake-Waldron association: Nearly level, well drained and somewhat poorly drained soils formed in silty, loamy, and clayey alluvium; on flood plains
5	Goss-Crider-Gatewood association: Moderately sloping to very steep, well drained soils formed in loess and residuum weathered from cherty dolomite, shale, and limestone; on uplands
6	Dockery-Haymond-Sensabaugh association: Nearly level, somewhat poorly drained and well drained soils formed in silty and cherty, loamy alluvium; on flood plains
7	Lomax-Blase association: Nearly level, well drained and somewhat poorly drained soils formed in loamy, sandy, and clayey alluvium; on terraces

Compiled 1981

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
MISSOURI AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP
ST. CHARLES COUNTY, MISSOURI

Scale 1: 253,440

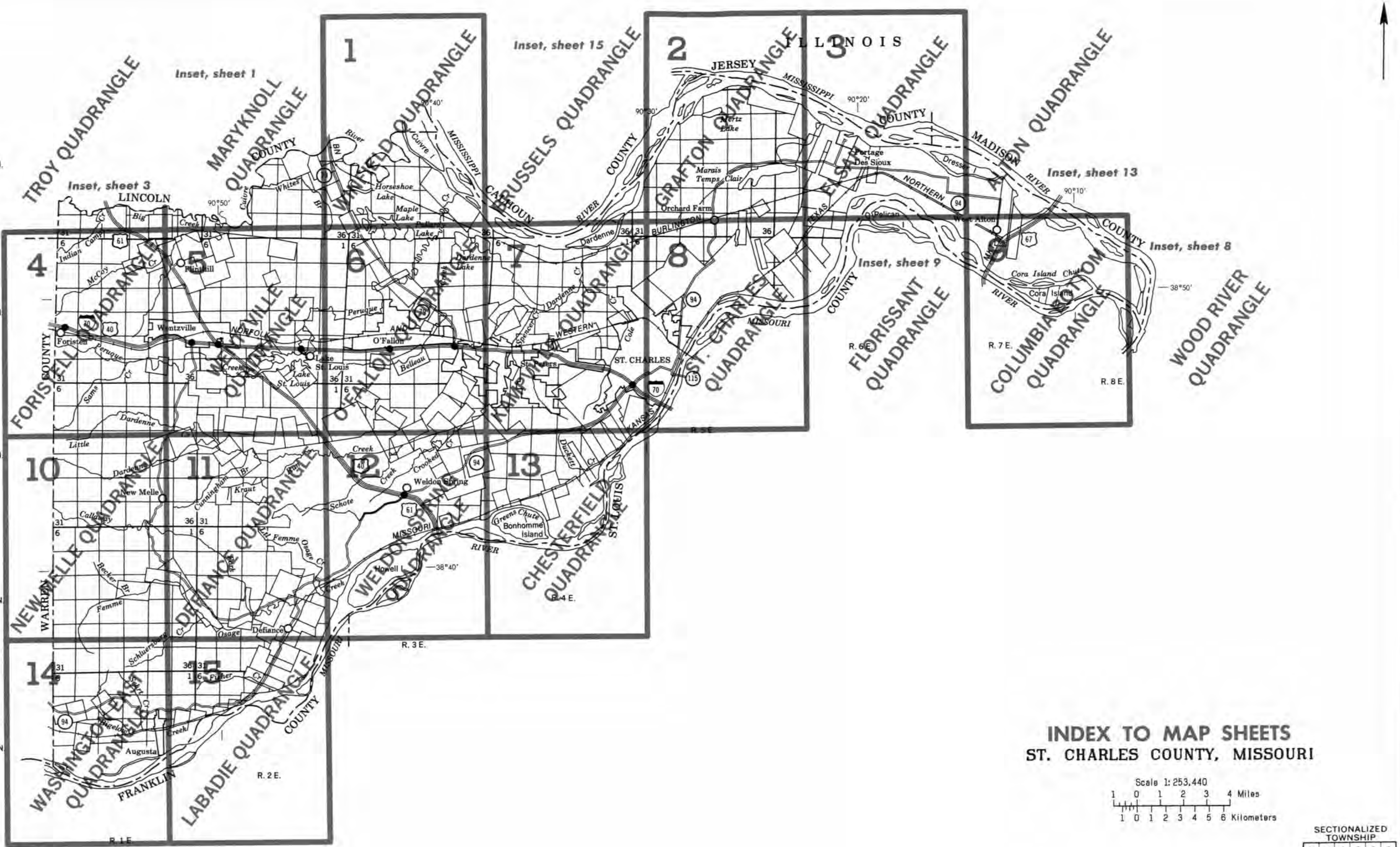
1 0 1 2 3 4 Miles

1 0 1 2 3 4 5 6 Kilometers

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



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18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
ST. CHARLES COUNTY, MISSOURI

SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and letters. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded.

SYMBOL	NAME
2D	Goss silt loam, 5 to 14 percent slopes
2F	Goss cherty silt loam, 14 to 35 percent slopes
3	Twomile silt loam
4D	Menfro-Goss silt loams, 9 to 14 percent slopes
6C	Crider silt loam, 5 to 9 percent slopes
6D2	Crider silt loam, 9 to 14 percent slopes, eroded
6E	Crider silt loam, 14 to 20 percent slopes
7B	Menfro silt loam, 2 to 5 percent slopes
7C	Menfro silt loam, 5 to 9 percent slopes
7D2	Menfro silt loam, 9 to 14 percent slopes, eroded
7E2	Menfro silt loam, 14 to 20 percent slopes, eroded
7F	Menfro silt loam, 20 to 30 percent slopes
8C	Winfield silt loam, 5 to 9 percent slopes
8D	Winfield silt loam, 9 to 14 percent slopes
8E2	Winfield silty clay loam, 14 to 20 percent slopes, eroded
9E	Holstein loam, 14 to 35 percent slopes
10F	Gasconade-Rock outcrop complex, 15 to 50 percent slopes
11	Dockery silt loam
12	Kennebec silt loam
13	Auxvasse silt loam
22F	Gatewood-Gasconade-Crider complex, 15 to 50 percent slopes
24D2	Keswick silt loam, 9 to 14 percent slopes, eroded
27C	Armster silt loam, 5 to 9 percent slopes
31C	Hatton silt loam, 5 to 9 percent slopes
34E	Lindley loam, 14 to 20 percent slopes
35B	Mexico silt loam, 1 to 5 percent slopes
37	Marion silt loam
40	Westerville silt loam
41	Freeburg silt loam
43	Cedargap silt loam
44	Sensabaugh silt loam
48A	Weller silt loam, 0 to 2 percent slopes
48B	Weller silt loam, 2 to 5 percent slopes
48C	Weller silt loam, 5 to 9 percent slopes
54C	Harvester-Urban land complex, 2 to 9 percent slopes
54D	Harvester-Urban land complex, 9 to 14 percent slopes
62	Edinburg silty clay loam
63B	Herrick silt loam, 2 to 5 percent slopes
67E	Menfro silt loam, karst, 5 to 20 percent slopes
70	Booker clay
71	Waldron silty clay
72	Blake silty clay loam
73	Haynie silt loam
74	Carr fine sandy loam
75	Hodge loamy fine sand
76	Haynie-Blake complex
77	Hodge-Blake complex
79	Dupo silt loam
80	Portage clay
81	Haymond silt loam
82	Chequest silt loam
83	Lomax loam
84	Blase silty clay loam
85	Carlow silty clay loam
86	Kampville silt loam
90	Hurst silt loam
91	Pits, quarries

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- State
- County
- Reservation (wildlife area)
- Land grant
- Neatline

AD HOC BOUNDARY (label)

- Cemetery

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections)

ROAD EMBLEMS & DESIGNATIONS

- Interstate — 70
- Federal — 67
- State — 94
- County — N

LEVEES

DAMS

- Large (to scale)
- Medium or small — water, w

PITS

- Mine or quarry

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Drainage ditch

LAKES, PONDS AND RESERVOIRS

- Perennial — water, w
- Intermittent — int, i

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — 2F, 24D2

SHORT STEEP SLOPE

DEPRESSION OR SINK

MISCELLANEOUS

- Gravelly spot
- Sandy spot

This map was compiled by U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies on 1980 orthophotography obtained from U.S. Department of the Interior, Geological Survey.

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
Scale 1:24000

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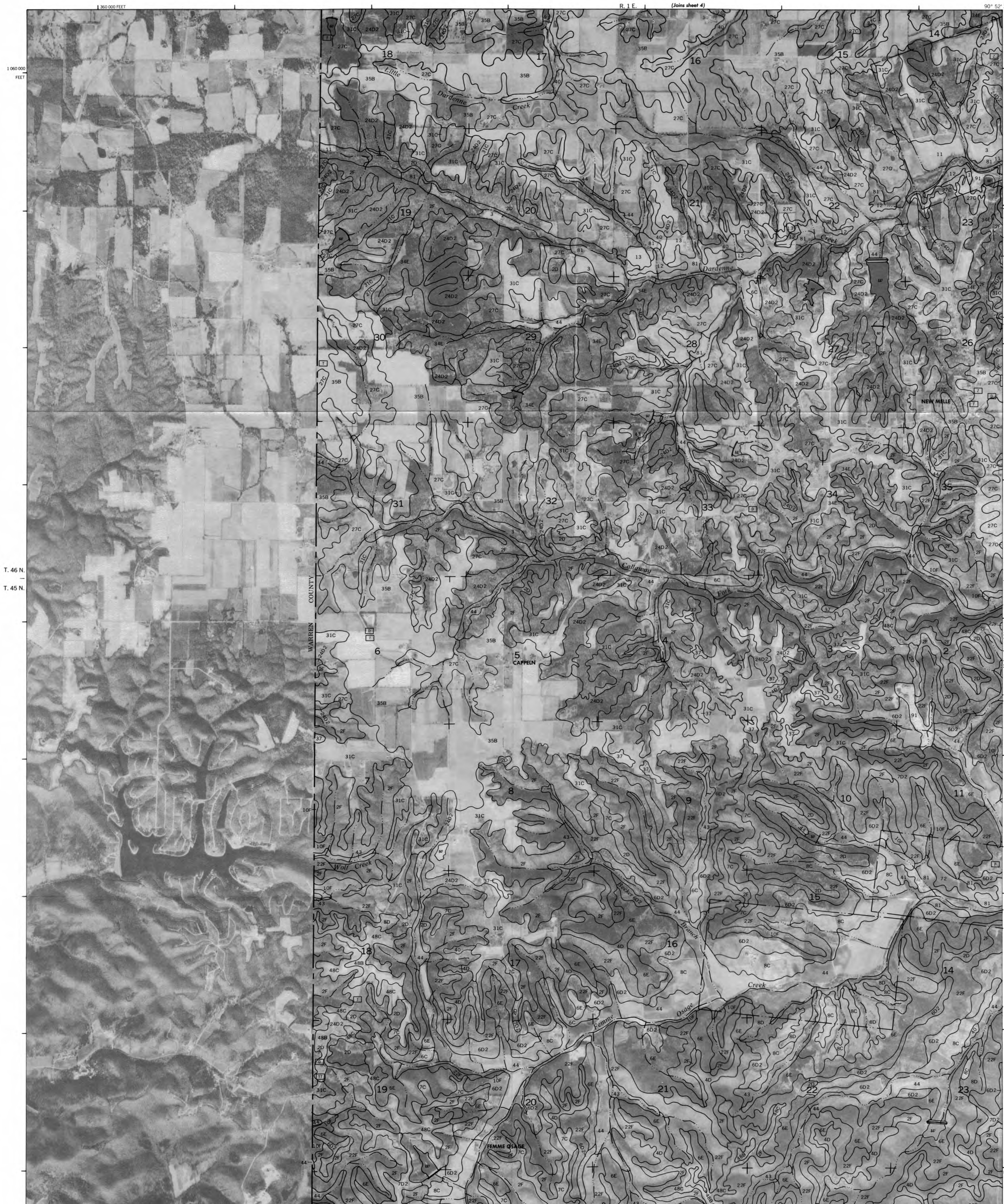

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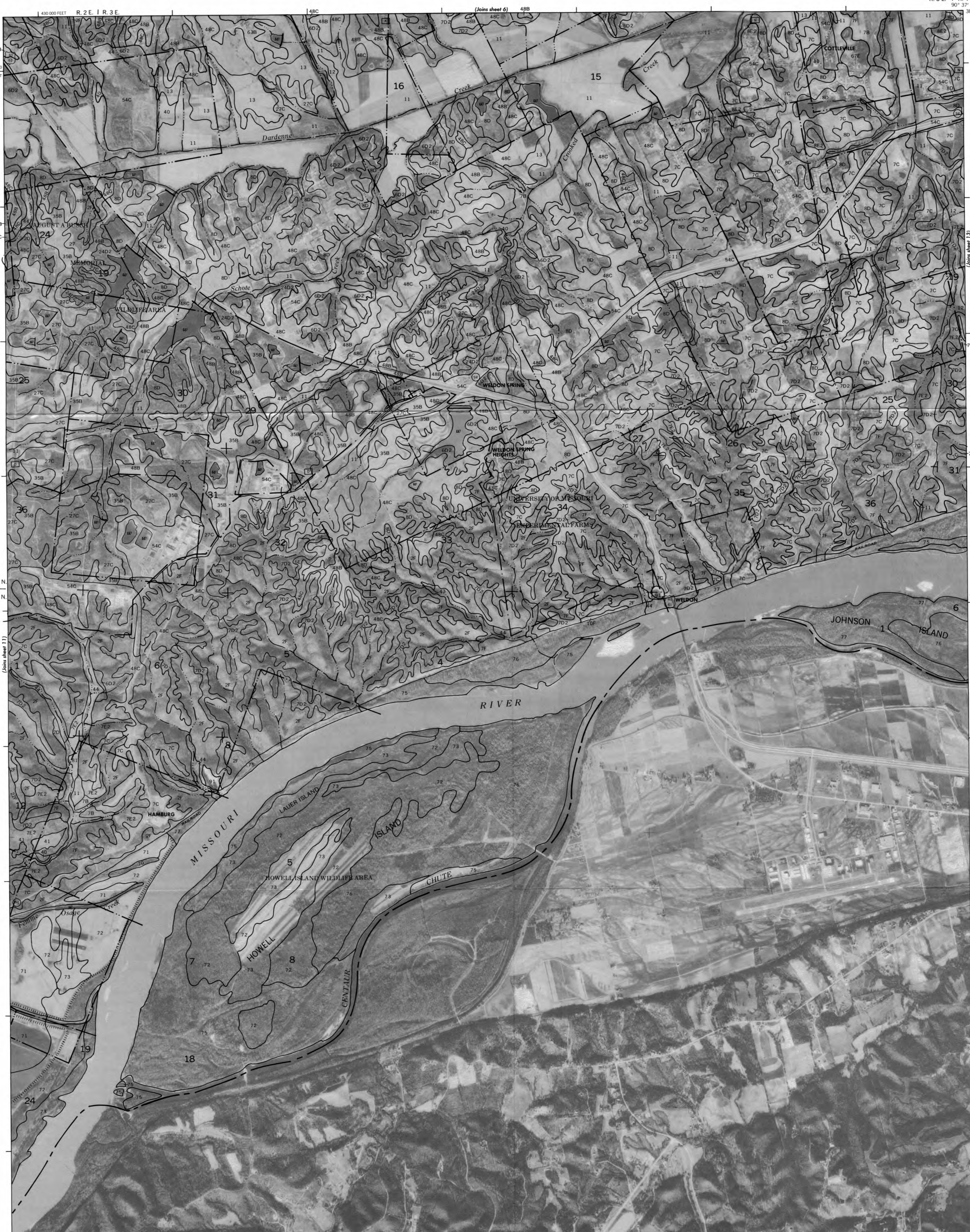
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 12
ST. CHARLES COUNTY, MISSOURI
(WELDON SPRING QUADRANGLE)



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Scale 1:24000

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U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 14
ST. CHARLES COUNTY, MISSOURI
(WASHINGTON EAST QUADRANGLE)

Scale 1:24 000
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS

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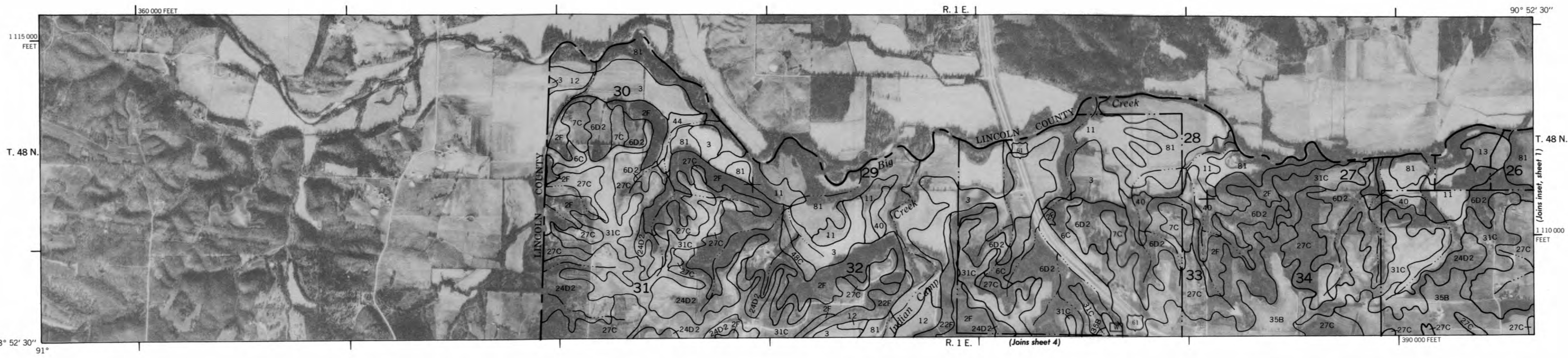

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